

# New Species of *Calliostoma* Swainson, 1840 (Gastropoda: Trochidae), and Notes on Some Poorly Known Species from the Western Atlantic Ocean

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## ABSTRACT

Twenty-seven new species of *Calliostoma* Swainson (*sensu lato*) are described from the western Atlantic Ocean. *Trochus* (*Ziptyphinus*) *strophorus* Watson is confirmed to be a *Calliostoma*, with *C. arestum* Dall as a synonym, and *Trochus* (*Margarita*) *dnopherus* Watson is transferred to *Calliostoma*. New records and observations are presented for *C. apicinum* Dall, *C. indiana* Dall, *C. orion* Dall, *C. aurora* Dall, *C. fernandezi* Princz, *C. atlantis* Clench & Aguayo, *C. axelolssoni* Quinn (new name for *C. olssoni* Bayer), and *C. adpersum* (Philippi). External morphologies of the head-foot of 13 species are briefly described, and illustrations of the radulae of 13 species are presented, along with pertinent remarks.

**Key words:** Trochidae, Calliostomatinae, *Calliostoma*, systematics, new species, new records, radulae.

## INTRODUCTION

The subfamily Calliostomatinae is by far the most speciose trochid subfamily in the western Atlantic Ocean. Species occur from the subarctic waters of Canada to the subantarctic waters of southern Argentina and the Antarctic waters of South Georgia Island (Powell, 1951; Clench & Turner, 1960). Calliostomatines inhabit a great variety of habitats, both biotic and abiotic, in depths ranging from the shallow subtidal to several hundred meters (Clench & Turner, 1960; Reed & Mikkelsen, 1987; Quinn, in press).

The greatest number of species of Calliostomatinae is assigned to the rather ill-defined genus *Calliostoma* Swainson, 1840. Clench and Turner (1960) monographed the western Atlantic species of the genus and concluded that 41 names represented valid species (including 5 new species), 24 names were synonyms, and 8 names were not referable to the genus. Subsequent studies (Merrill,

1970; Bayer, 1971; Princz, 1978; Quinn, 1979, in press; Rios, 1985, 1990) have revealed one new synonym and two new species, reinstated two species excluded by Clench and Turner, and resurrected three species from synonymy. Another 15 nominal species and subspecies not treated by Clench and Turner (1960) have been described from off southern Argentina (Philippi, 1845 [in 1842–1851]; Martens, 1881; Smith, 1881, 1915; Rochbrune & Mabilie, 1889; Strebel, 1905, 1908); a few of these species were discussed or mentioned by Powell (1951), who later (1960) published a complete list, but most of these species remain essentially unknown. Including the 27 new species described in this paper, the 2 here reassigned to the genus, and at least 7 that are currently unnamed, almost 100 valid Recent species of *Calliostoma* are now known from the western Atlantic (Table 1). In contrast, only 36 species of *Calliostoma* are known to occur in the eastern Pacific (Table 2) (see Dall, 1909; McLean, 1970, 1971, 1984; Rehder, 1971; McLean & Andrade, 1982). The number of valid Recent species of *Calliostoma* now known in the Americas is somewhat greater than the number of species described from the Neogene formations of the Americas.

At least six other calliostomatine species occur only off Argentina and in the Falkland and South Georgia Islands (Powell, 1951, 1960). Powell assigned two species each to *Falsimargarita* Powell, 1951, and *Photinastoma* Powell, 1951, and one species each to *Venustatrochus* Powell, 1951, and *Photinula* Adams and Adams, 1854. Clench and Turner (1960) assigned *Calliostoma blakei* Clench and Aguayo, 1938, to *Photinula*, but characters of the animal and radula show that the species should be assigned to the Lirulariinae Hickman and McLean, 1990 (Quinn, in preparation).

During the preparation of monographs of the Trochidae of the Gulf of Mexico (Quinn, in press) and the

adjoining Straits of Florida (Quinn, 1979), I examined specimens of many calliostomatine species collected from throughout the Caribbean Sea and southwestern Atlantic Ocean, most obtained subsequent to Clench and Turner's 1960 monograph. Many of the species represented in that material were clearly undescribed, some were found to be species complexes, and others represented significant range extensions of previously described but poorly known species. The purposes of this paper are to provide descriptions of the new species, to clarify the identities of some species, and to report new distributional data for species of *Calliostoma* in the western Atlantic Ocean. The external morphologies of the head-foot of 13 of the species are briefly described, and radulae of 13 species are illustrated. However, because so few species of western Atlantic *Calliostoma* have had their anatomy and radula illustrated, and because character states are so poorly understood for species worldwide, speculations on relationships based on the present observations are premature. Of particular interest would be optical microscope observations to clarify characteristics of these radulae as espoused by Hickman (1977).

Numerous genus-level taxa have been proposed for perceived species groups within Calliostomatinae. Although some authors incorporated features of the external anatomy and radula (e.g., Powell, 1951; Clench & Turner, 1960), most of these names were based on shell characters alone, and some names seem to reflect a regional bias of the authors; however, the morphological limits of these nominal taxa are nebulous, and a worldwide survey of genus-level taxa is needed. Therefore, the species discussed in the present paper are not formally assigned to nominal subgenera, but the following species groups are recognized as relatively distinct: the *C. pulchrum* group (*Calliostoma* s.s., or *Eucasta* Dall, 1889a); the *C. jujubinum* group (*Elmerlinia* Clench & Turner, 1960); the *C. bairdii* group (*Kombologion* Clench & Turner, 1960); the *C. sayanum* group; the *C. circumcinctum* group (?=*Otukaia* Ikebe, 1942); the *C. atlantis* group. Many western Atlantic species cannot be satisfactorily assigned to any species group, but a forthcoming revision of the southwestern Pacific calliostomatine species (B. A. Marshall, in litt.) may help clarify some of these uncertainties.

For brevity, authors and dates of publication for species included in Tables 1 and 2 are not repeated in the Remarks section of the species accounts. Species not included in those tables are cited with their authors and dates whenever mentioned in the text. Bibliographic references of species included in Tables 1 and 2 are not included in the Literature Cited section unless the species are also included in the text; most of these citations are readily available in Clench and Turner (1960), Keen (1971), and Quinn (in press).

Acronyms for specimen repositories are as follows: AMNH (American Museum of Natural History, New York); ANSP (Academy of Natural Sciences of Philadelphia); BM(NH) (The Natural History Museum, London); DMNH (Delaware Museum of Natural History,

Wilmington); FSBC I (Invertebrate Collection, Florida Marine Research Institute, St. Petersburg); HMNS (Houston Museum of Natural History, Texas); LACM (Natural History Museum of Los Angeles County, California); MCZ (Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts); MORG (Museu Oceanográfico da Fundação Universidade do Rio Grande, Rio Grande, Rio Grande do Sul, Brazil); UF (Florida Museum of Natural History, University of Florida, Gainesville); UMML (Rosenstiel School of Marine and Atmospheric Science, University of Miami, Florida); USNM (National Museum of Natural History, Smithsonian Institution, Washington, DC).

## SYSTEMATICS

Superfamily Trochoidea Rafinesque, 1815

Family Trochidae Rafinesque, 1815

Subfamily Calliostomatinae Thiele, 1924

Genus *Calliostoma* Swainson, 1840

Type species (subsequent designation; Herrmannsen, 1846:154): *Trochus conulus* Linnaeus, 1758.

*Calliostoma hilare* new species  
(figures 1, 2)

**Description:** Shell medium-sized, attaining height of 14.5 mm, width of 11.5 mm, conical, nonumbilicate, finely sculptured. Protoconch 375  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls 8.6, flat-sided; first whorl with weak axial riblets and 2 strong spiral cords; axial riblets disappearing on second whorl; spiral sculpture increasing by intercalation to 7 cords and 4 threads; suprapерipheral spiral cords finely beaded, beads crowded, rounded; periphery of first 4 whorls sharply carinate, composed of abapical spiral cord set with sharply conical beads, periphery of subsequent whorls narrowly rounded, composed of two adpressed spiral cords set with rounded beads. Base weakly convex, with 15 narrow, finely beaded spiral cords, cords becoming broader and more coarsely beaded adaxially. Aperture subquadrate, lips thin; columella almost straight, thickened, slightly twisted, terminating in weak, rounded denticle. Shell ground color golden yellow with greenish iridescence, with light golden brown and white spots alternating along periphery; white spots spirally elongate, brown spots axially elongate.

**Holotype:** USNM 860249, height 14.5 mm, width 11.5 mm.

**Type locality:** Off northwestern tip of Little Bahama Bank, JOHN ELLIOTT PILLSBURY Station P-198, 27°30'N, 79°10'W, in 242 m.

**Distribution:** This species is known only from the holotype, an empty shell, collected in 242 m off the northwestern tip of the Little Bahama Bank.

**Remarks:** The holotype of *C. hilare* is most similar to

**Table 1.** Geographic and bathymetric distributions of calliostomatine species in the western Atlantic Ocean.

Species	Depth (m)	Distribution
<i>Calliostoma</i> Swainson, 1840		
<i>jujubinum</i> (Gmelin, 1791)	0–10	4
<i>javanicum</i> (Lamarek, 1822)	0–40	4
<i>occidentale</i> (Mighels & A. Adams, 1842)	30–1,800	1, 2–
<i>gemmosum</i> (Reeve, 1842)	10–100	6
<i>nudum nudum</i> (Philippi, 1845)	?	7
<i>tampaense</i> (Conrad, 1846)	0–10	3–
<i>jucundum</i> (Gould, 1849)	20–30	7
<i>pulchrum</i> (C. B. Adams, 1850)	0–70	3, 4, 5, ?6
<i>adpersum</i> (Philippi, 1851)	0–40	5, 6
<i>euglyptum</i> (A. Adams, 1855)	10–30	3
<i>dnopherum</i> (Watson, 1879)	640	6*
<i>strophorum</i> (Watson, 1879)	700	3–, 4–
<i>coppingeri</i> Smith, 1880	10–80	6, 7
<i>bairdii</i> Verrill & Smith, 1880	70–450	2
<i>apicinum</i> Dall, 1881	100–200	4–
<i>circumcinctum</i> Dall, 1881	200–300	4–
<i>echinatum</i> Dall, 1881	70–150	4
<i>orion</i> Dall, 1881	20–60	4
<i>roscolum</i> Dall, 1881	40–80	3
<i>sapidum</i> Dall, 1881	100–250	?3–, 4
<i>yucatecanum</i> Dall, 1881	15–60	3
<i>consimilis</i> (Smith, 1881)	?	7
<i>aurora</i> Dall, 1888	180–1,050	4
<i>benedicti</i> Dall, 1889	365	3–*
<i>brunneum</i> (Dall, 1889)	20–70	4
<i>cinctellum</i> Dall, 1889	?–300	3–, 4*
<i>indiana</i> Dall, 1889	50–100	4
<i>psyche</i> Dall, 1889	100–400	3–
<i>sayanum</i> Dall, 1889	150–300	3–
<i>dozei</i> Rochebrune & Mabile, 1889	?	7
<i>nudum roscotinctum</i> Rochebrune & Mabile, 1889	?	7
<i>optimum</i> Rochebrune & Mabile, 1889	?	7
<i>senius</i> Rochebrune & Mabile, 1889	?	7
<i>irisans</i> Strebel, 1905	?	7
<i>kophamei</i> Strebel, 1905	?	7
<i>moebiusi</i> Strebel, 1905	90	7
<i>nudum flavidocarnea</i> Strebel, 1905	?	7
<i>marionae</i> Dall, 1906	40–120	3
<i>militare</i> Ihering, 1907	30–65	6, 7
<i>andersoni</i> Strebel, 1908	?	7
<i>falklandicum</i> Strebel, 1908	15–250	7
<i>modestulum</i> Strebel, 1908	65–350	7
<i>nordenskjoldi</i> Strebel, 1908	?	7
<i>venustulum</i> Strebel, 1908	40	7
<i>depictum</i> Dall, 1927	1–7	6
<i>halibrectum</i> Dall, 1927	535	3*
<i>hendersoni</i> Dall, 1927	150–350	3–
<i>sarcodum</i> Dall, 1927	1–10	4
<i>amazonicum</i> Finlay, 1930	?	7
<i>bigelowi</i> Clench & Aguayo, 1938	375–430	4*
<i>schroederi</i> Clench & Aguayo, 1938	250–450	4–
<i>hassler</i> Clench & Aguayo, 1939	65	6*
<i>atlantis</i> Clench & Aguayo, 1940	?–600	4–
<i>carcellesi</i> Clench & Aguayo, 1940	50	7*
<i>cubanum</i> Clench & Aguayo, 1940	900	4*
<i>torrei</i> Clench & Aguayo, 1940	700	4*
<i>fascinans</i> Schwengel & McGinty, 1942	70–120	3
<i>barbouri</i> Clench & Aguayo, 1946	25–100	3–, 4
<i>adclae</i> Schwengel, 1951	0–2	3–
<i>bullisi</i> Clench & Turner, 1960	70	5*

Table 1. Continued

Species	Depth (m)	Distribution
<i>jeanneae</i> Clench & Turner, 1960	?	4*
<i>oregon</i> Clench & Turner, 1960	200-350	3-
<i>rosewateri</i> Clench & Turner, 1960	274-641	4-
<i>springeri</i> Clench & Turner, 1960	200-450	3-
<i>fernandezii</i> Princz, 1978	45-145	5
<i>alternum</i> Quinn, 1992	55-146	5
<i>argentum</i> Quinn, 1992	350-450	4
<i>atlantoides</i> Quinn, 1992	400-600	4*
<i>aulicum</i> Quinn, 1992	10-50	5
<i>axelolssoni</i> Quinn, 1992	200-300	4-, 6-
<i>bermudense</i> Quinn, 1992	82	3*
<i>brunneopictum</i> Quinn, 1992	50-80	6*
<i>cnidophilum</i> Quinn, 1992	150-350	3
<i>coronatum</i> Quinn, 1992	770-800	6*
<i>cubense</i> Quinn, 1992	0-20	4-
<i>debile</i> Quinn, 1992	?	4*
<i>dentatum</i> Quinn, 1992	15-55	3-
<i>fucosum</i> Quinn, 1992	5-9	5*
<i>gusti</i> Quinn, 1992	183-219	4*
<i>hilare</i> Quinn, 1992	250	4*
<i>hirtum</i> Quinn, 1992	520	4*
<i>moscatellii</i> Quinn, 1992	50-80	6
<i>purpureum</i> Quinn, 1992	0-60	5-
<i>rota</i> Quinn, 1992	27	6*
<i>rude</i> Quinn, 1992	60-90	5-
<i>rugosum</i> Quinn, 1992	?	4*
<i>scalenum</i> Quinn, 1992	25-80	3
<i>scurra</i> Quinn, 1992	20-90	5
<i>semisuave</i> Quinn, 1992	70-155	5-
<i>serratulum</i> Quinn, 1992	120-190	5-
<i>tenebrosus</i> Quinn, 1992	?	6*
<i>vinosum</i> Quinn, 1992	18-22	6
<i>viscardii</i> Quinn, 1992	40-45	6*
<i>Venustatrochus</i> Powell, 1951		
<i>georgianus</i> Powell, 1951	120-200	7*
<i>Falsimargarita</i> Powell, 1951		
<i>gemma</i> (Smith, 1915)	200-400	8
<i>iris</i> (Smith, 1915)	225-450	7
<i>Photinula</i> Adams & Adams, 1854		
<i>coerulescens</i> (King & Broderip, 1831)	0-200	7
<i>Photinastoma</i> Powell, 1951		
<i>taeniata taeniata</i> (Wood, 1828)	0-80	7
<i>taeniata nivea</i> (Cooper & Preston, 1910)	0-100	7*
? <i>gamina</i> (Rochebrune & Mabile, 1889)	?	7

\* Known only from the type lot or locality; 1 = northern boreal, 2 = "Virginian" (Cape Cod to Cape Hatteras); 3 = Carolinian; 4 = Caribbean; 5 = northern South America; 6 = Brazil-northern Argentina; 7 = Patagonian; 8 = Subantarctic; "-" indicates restricted range within region.

shells of *C. rude* in shape, size, and sculpture, but it differs by having a slightly larger protoconch (375  $\mu$ m vs. 350  $\mu$ m); by having the peripheral spiral cord strong and sharply beaded on whorls 2-4, becoming weaker and with rounded beads on later whorls, whereas the peripheral cord of *C. rude* is inconspicuous on the first three whorls, becoming very strong and coarsely beaded on subsequent whorls; and by having more numerous

but weaker spiral cords. *Calliostoma hilare* is also similar to *C. serratulum*, but the shell of the former has a smaller protoconch (375  $\mu$ m vs. 400-425  $\mu$ m), is proportionately narrower, has more numerous spiral cords that are more weakly beaded, and has a periphery that is composed of two subequal, finely beaded, adpressed cords rather than a strong, coarsely beaded upper cord and a weaker lower cord.



**Table 2.** Geographic and bathymetric distributions of calliostomatine species in the eastern Pacific Ocean.

Species	Depth (m)	Distribution
<i>Calliostoma</i> Swainson, 1840		
<i>annulatum</i> (Lightfoot, 1786)	"offshore"	1
<i>canaliculatum</i> (Lightfoot, 1786)	25-750	1
<i>antonii</i> (Koch, 1843)	0-3	3
<i>eximium</i> (Reeve, 1843)	0-40	3
<i>ligatum</i> (Gould, 1849)	0-3	1
<i>leanum</i> (C. B. Adams, 1852)	0-3	3
<i>fonkii</i> (Philippi, 1860)	?-457	3, 4
<i>gemmulatum</i> Carpenter, 1864	0-3	2
<i>splendens</i> Carpenter, 1864	"offshore"	2
<i>supragranosum</i> Carpenter, 1864	0-3	2
<i>variegatum</i> Carpenter, 1864	25-750	1
<i>aequisculptum</i> Carpenter, 1865	1-3	3
<i>tricolor</i> Gabb, 1865	15-60	2, 3
<i>gloriosum</i> Dall, 1871	0-40	2
<i>palmeri</i> Dall, 1871	0-45	3
<i>platinum</i> Dall, 1890	50-750	1
<i>turbinum</i> Dall, 1895	60-120	2
<i>iridium</i> Dall, 1896	230-280	3
<i>nepheloide</i> Dall, 1913	50-125	3
<i>bonita</i> Strong, Hanna, & Hertlein, 1933	35-75	3
<i>rema</i> Strong, Hanna, & Hertlein, 1933	20-45	3
<i>marshalli</i> Lowe, 1935	0-3, "offshore"	3
<i>mcleani</i> Shasky & Campbell, 1964	5-10	3
<i>gordanum</i> McLean, 1970	128	2*
<i>jacquelinae</i> McLean, 1970	146	3*
<i>keenae</i> McLean, 1970	55-110	2, 3
<i>sanjaimense</i> McLean, 1970	137	2*
<i>santacruzianum</i> McLean, 1970	45	3*
<i>celeroae</i> McLean, 1970	60-100	3
<i>insignis</i> Olsson, 1971	50-80	3
<i>joanneae</i> Olsson, 1971	53	3*
<i>pillsburyae</i> Olsson, 1971	57-64	3*
<i>chilena</i> Rehder, 1971	200-750	3, 4
<i>delli</i> McLean & Andrade, 1982	200-450	4-
<i>bernardi</i> McLean, 1984	125-175	1
<i>titanium</i> McLean, 1984	200-300	2-

\* Known only from the type lot or locality; 1 = northern boreal; 2 = Californian; 3 = Panamic; 4 = Peruvian; "-" indicates restricted range within region.

*Calliostoma serratulum* new species  
(figures 3-6)

*Calliostoma* sp. 4 Bayer *et al.*, 1970:A29, A137, A146.

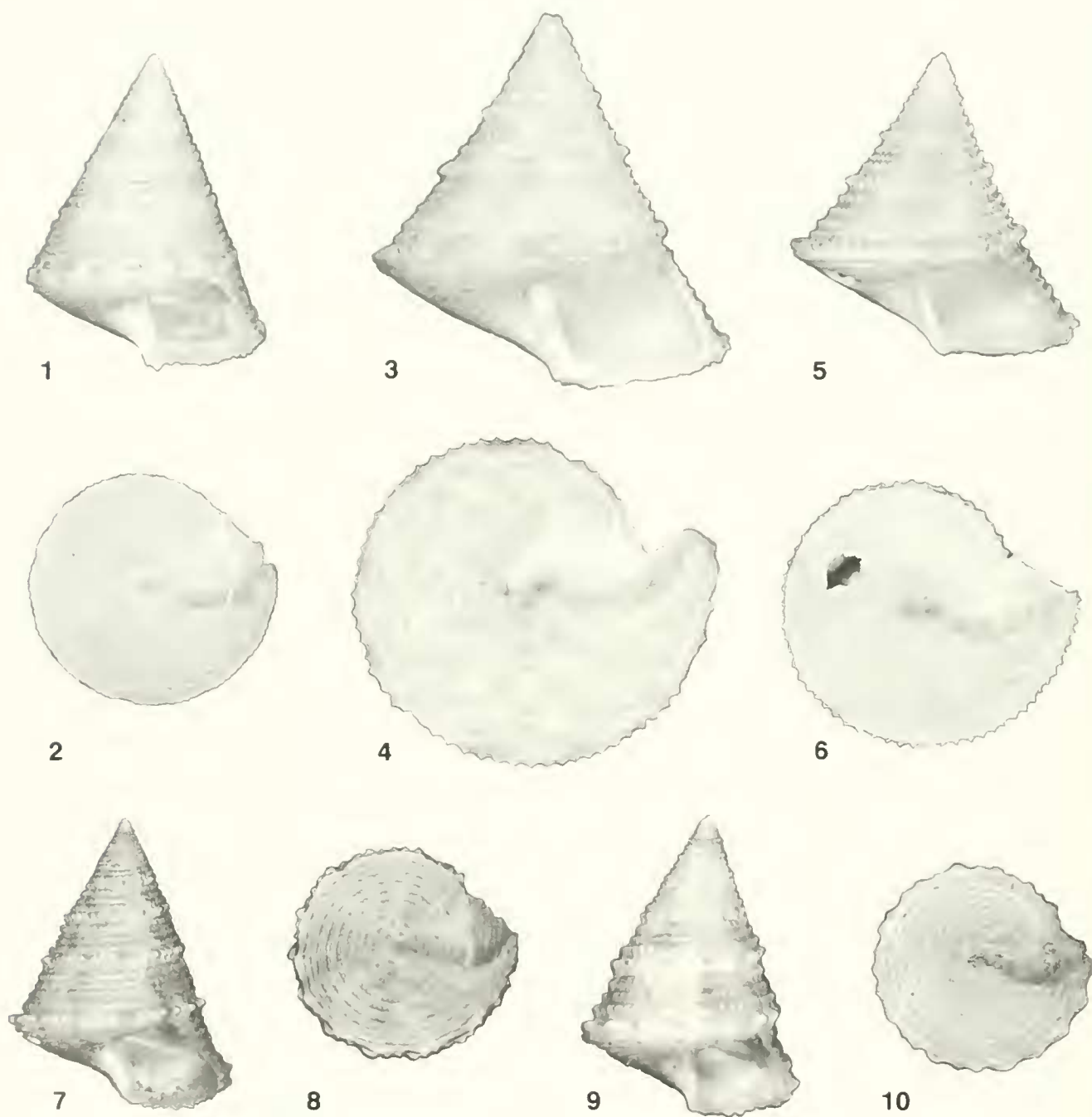
**Description:** Shell medium-sized, attaining height of 16.7 mm, width of 16.4 mm, conical, nonumbilicate, coarsely sculptured. Protoconch 400-425  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls about 7, flat; first 2 whorls with low, rounded axial riblets and 2 strong, beaded spiral cords; axial riblets gradually disappearing on whorls 3-5; spiral sculpture increasing by intercalation to 5-8 cords and 0-5 threads, of which abapical 2 cords forming periphery; periphery sharply carinate; adapical peripheral cord strong, projecting, set with strong, conical beads, beads crossed by 2 fine spiral threads producing squarish apices; abapical peripheral cord weaker, weakly beaded. Base weakly convex, with 13-17 narrow, weakly beaded spiral cords, adaxial 2-3 cords

stronger, more widely spaced, and more distinctly beaded. Aperture subquadrate, lips thin, weakly crenulate; columella concave above, straight below, thickened, terminating in weak, rounded denticle. Shell ground color golden yellow with spots and axial streaks of brown; beads white; basal spiral cords with elongate spots of brown, darkest on adaxial 2-3 cords.

**Holotype:** USNM 860250, height 12.5+ mm, width 12.3 mm.

**Type locality:** Southwest of Cartagena, Colombia, JOHN ELLIOTT PILLSBURY Station P-375, 9°59.0'N, 76°02.0'W, in 135-130 m.

**Paratypes:** 1, UMML 30.3539; off Santa Marta, Colombia, JOHN ELLIOTT PILLSBURY Station P-399, 9°01.3'N, 76°40.2'W, 119-179 m; 17 July 1966; 10-ft otter trawl.—1, UMML 30.6935; 1, FSBC 1 44069; off Península de



Figures 1, 2. *Calliostoma lulare* new species, holotype, USNM 860249; height 14.5 mm, width 11.5 mm. Figures 3–6. *Calliostoma serratulum* new species. 3, 4. Holotype, USNM 860250; height 12.5+ mm, width 12.3 mm. 5, 6. Paratype, UMML 30.3539; height 10.1 mm, width 10.0 mm. Figures 7, 8. *Calliostoma rude* new species, holotype, USNM 860251; height 13.3 mm, width 10.6 mm. Figures 9, 10. *Calliostoma* sp. cf. *rude*, specimen from off Barbados, Sunderland collection; height 9.7 mm, width 7.3 mm.

Paraguaná, Venezuela, JOHN ELLIOTT PILLSBURY Station P-757, 11°39.6'N, 69°22.1'W, 161–187 m; 27 July 1968; 10-ft otter trawl.

**Other material:** 4 broken, UMML 30.8366; off Santa Marta, Colombia, JOHN ELLIOTT PILLSBURY Station P-785, 11°16.9'N, 74°17.0'W, 176–165 m; 31 July 1968; 10-ft otter trawl.

**Distribution:** *Calliostoma serratulum* is known only from empty shells trawled from off the northeastern coast of Colombia and northwestern coast of Venezuela in 119–187 m.

**Remarks:** Shells of *C. serratulum* are most similar to those of *C. rude* but differ by having a much larger protoconch (400–425  $\mu$ m vs. 350  $\mu$ m), by being propor-

tionately wider, and by having the adapical peripheral cord set with uniformly sized beads that are squarish in profile.

*Calliostoma rude* new species

(figures 7, 8)

**Description:** Shell medium-sized, attaining height of 13.3 mm, width of 10.6 mm, conical, nonumbilicate, coarsely sculptured. Protoconch 350  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls 8.3, flat; first whorl with low, rounded axial riblets and 2 strong, beaded spiral cords; axial sculpture absent after first whorl; spiral sculpture increasing by intercalation to 5–6 cords and 1–2 threads, of which abapical 2 cords forming periphery; periphery sharply carinate; adapical peripheral cord strong, strongly beaded, beads triangular, every third or fourth bead markedly larger; abapical peripheral cord weaker, strongly undulate. Base weakly convex, with 11–13 strong, narrow, finely beaded spiral cords. Aperture subquadrate, lips thin, finely crenulate; columella almost straight, thickened, terminating in weak, rounded denticle. Shell ground color ivory with greenish and reddish iridescence; streaks and flammules of golden brown present above periphery; periphery with spots of darker brown; base with light golden-brown spots arranged on cords to form obscure, crescentic radial streaks.

**Holotype:** USNM 860251, height 13.3 mm, width 10.6 mm.

**Type locality:** Off Cayenne, French Guiana, JOHN ELLIOTT PILLSBURY Station P-650, 6°07.0'N, 52°19.0'W, in 84–91 m.

**Paratypes:** 2, UMML 30.5844; 1, FSBC I 44076; from same lot as holotype.—2, MCZ 302593; off Georgetown, Guyana, CHAIN Cruise 35, Station 35+36, 8°10.5'–8°10.0'N, 57°48'W, 53–60 m; 28 April 1963.

**Distribution:** *Calliostoma rude* is known only from two collections, one off Georgetown, Guyana, in 53–60 m, and the other from the type locality off Cayenne, French Guiana, in 84–91 m; the latter collection contained a single live-collected specimen. The field notes on the type locality cite shell rubble, and the associated invertebrates suggest that hard-bottom outcrops are nearby.

**Remarks:** Comparisons of shells of *Calliostoma rude* with those of the similar *C. serratum* and *C. hilare* are discussed in the remarks for the latter two species. The adapical peripheral cord of shells of *C. rude* is subequal to the other spiral cords on the first three whorls, but it becomes markedly stronger on the fourth and subsequent whorls. This characteristic separates *C. rude* from all other peripherally carinate species in which peripheral carination is present on the first whorls and either remains strong on all whorls (e.g., *C. cinctellum*) or disappears on the last one or two whorls (e.g., *C. echinatum*). The alternation of two or three small beads with a much larger triangular bead is also unique to *C. rude*. Four specimens collected from off the western coast

of Barbados (Figures 9, 10; Sunderland collection, ex F. Sander) are very similar to the types of *C. rude* but are relatively smaller and narrower and have some subtle sculptural differences that suggest that the Barbados shells may be a separate species.

*Calliostoma cnidophilum* new species

(figures 11–14, 107)

**Description:** Shell medium-sized, attaining height of 14.1 mm, width of 12.1 mm, conical, nonumbilicate, finely sculptured. Protoconch 375  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls about 8, flat; first whorl with low, rounded axial riblets and 2 strong, beaded spiral cords; axial riblets disappearing on second whorl; spiral sculpture increasing by intercalation to 10–12 cords and 0–2 threads, cords finely beaded; periphery of first 2–2.5 whorls sharply carinate, set with sharply conical beads; periphery becoming narrowly rounded on subsequent whorls, beads becoming finer, rounded; peripheral cord splitting into 2 subequal, adpressed cords on fifth whorl; periphery obscurely multiangulate when viewed from base. Base weakly convex, with 14–20 narrow, sharp, very finely beaded spiral cords. Aperture subquadrate, lips thin, finely crenulate; columella short, weakly concave, thickened. Shell ground color golden yellow with greenish iridescence; periphery with regularly spaced, spirally elongate pinkish spots. Animal (in alcohol) white; cephalic tentacles long, slender, gradually tapering, right longer than left, ocular peduncles long, slender, with large, black eye at tips; epipodium with 4 pairs of tentacles decreasing in size posteriorly, neck lobes well-developed, thin, semicircular, smooth.

**Holotype:** USNM 860265, height 13.7 mm, width 11.4 mm.

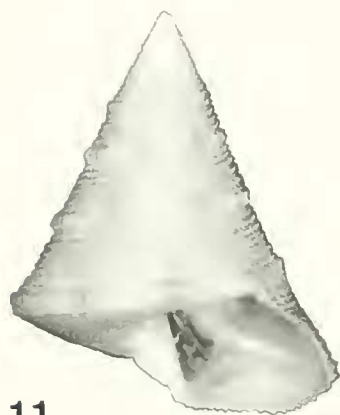
**Type locality:** Off Îlets-à-Goyaves, Guadeloupe, Lesser Antilles, JOHNSON-SEA-LINK II Station JSL-II-1845, 16°10'00"N, 61°49'08"W, in 306 m.

**Paratypes:** 2, UMML 30.8370; 1, FSBC I 44070; off Dominica, JOHN ELLIOTT PILLSBURY Station P-931, 15°31.2'N, 61°12.3'W, 174–357 m; 15 July 1969; 5-ft Blake trawl.

**Other material:** 1, Sunderland collection; off St. James, Barbados, 152 m; ex F. Sander.

**Distribution:** *Calliostoma cnidophilum* is known from the Lesser Antilles in depths of 152–357 m; living specimens were collected in 306 m and 174–357 m.

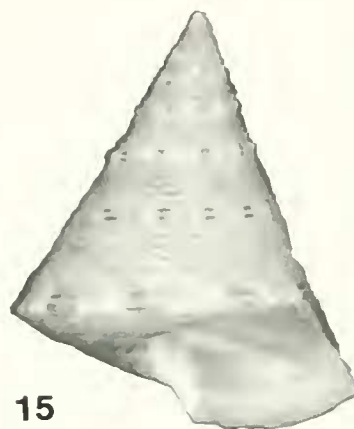
**Remarks:** Shells of *Calliostoma cnidophilum* are most similar to the holotype of *C. hilare* but differ by being proportionately broader; by having an obscurely multiangulate peripheral profile when viewed from the base; by having finer, more numerous spiral cords above the periphery; by having the spiral cords more finely beaded; and by having a shorter, thicker columella. The radula (formula  $\infty.5.1.5.\infty$ ; figure 107) differs from that illustrated by Clench and Turner for *C. pulchrum* (1960:pl.



11



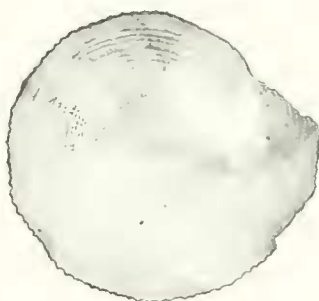
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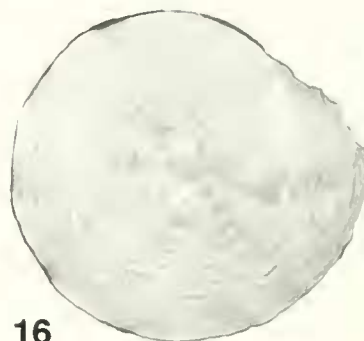
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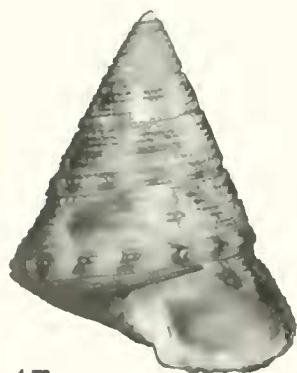
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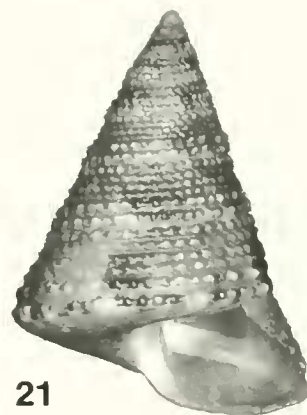
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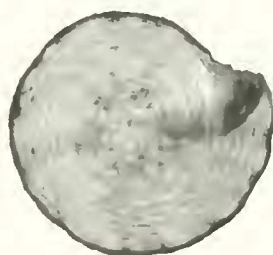
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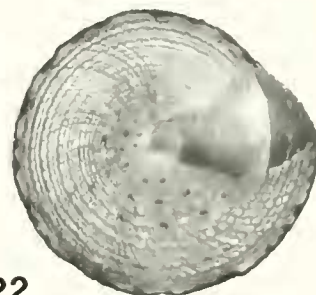
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22



3, fig. 3) by having the rachidian teeth with much broader bases and cusps and by having narrower cusps on the lateral teeth.

Observations made from the submersible JOHNSON-SEA-LINK II indicate that *C. cnidophilum* may feed on octocorals (M. G. Harasewych, personal communication; see also Harasewych *et al.*, 1992, fig. 12).

*Calliostoma semisuave* new species  
(figures 15, 16)

**Description:** Shell medium-sized, attaining height of 13.4 mm, width of 11.4 mm, conical, nonumbilicate, finely sculptured. Protoconch 400  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls 8.5, flat; first 4 whorls with low, rounded axial riblets and 2–4 strong beaded spiral cords; axial sculpture disappearing on fifth whorl; spiral sculpture increasing by intercalation to 11 cords and 2–3 threads, cords strongly beaded on first 5 whorls, beads gradually weakening on subsequent whorls; periphery sharply carinate, with single strong, smooth, peripheral cord. Base weakly convex, with 16–18 narrow, smooth to very weakly beaded spiral cords. Aperture subquadrate, lips thin; columella almost straight, thickened, terminating in sharp denticle. Shell ground color cream to light golden yellow, with diffuse spots and flammules of light golden brown; periphery with distinct, squarish spots of orange-brown.

**Holotype:** USNM 860252, height 13.4 mm, width 11.4 mm.

**Type locality:** West of Isla La Tortuga, Venezuela, JOHN ELLIOTT PILLSBURY Station P-736, 10°57.0'N, 65°52.0'W, in 69–155 m.

**Paratype:** 1, UMML 30.5915; off Pointe Isère, French Guiana, JOHN ELLIOTT PILLSBURY Station P-658, 7°10.0'N, 53°36.0'W, in 135–126 m; 9 July 1968; 10-ft otter trawl.

**Distribution:** *Calliostoma semisuave* is known from dead shells collected off eastern Venezuela and northwestern French Guiana in depths of 69–155 m.

**Remarks:** The shells of *Calliostoma semisuave* are most similar to those of *C. cnidophilum* but are proportionately narrower, have a larger protoconch, have the beading of the spiral cords becoming very weak on the last several whorls, and have a smooth peripheral cord on the last several whorls.

Other organisms listed on the field data sheets for the two collections of *C. semisuave* include sponges, alcyonarians, *Millepora*, *Haliotis*, and chitons, suggesting that this species lives on or near hard-bottom outcrops in depths of about 70–150 m.

*Calliostoma brunneopictum* new species  
(figures 17–20)

**Description:** Shell small, attaining height of 8.5 mm, width of 6.9 mm, conical, narrowly umbilicate or non-umbilicate, finely sculptured. Protoconch 365–375  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls 6.7, flat to weakly convex; first whorl with low, rounded axial riblets and 2 strong, beaded spiral cords; axial sculpture absent after first whorl; spiral sculpture increasing by intercalation to 8–12 cords and 1–3 threads, cords finely beaded, beads conical; periphery rather sharp on first 5 whorls, becoming narrowly rounded on last 2 whorls. Base weakly convex, with 12–16 narrow, finely beaded spiral cords, adaxial 2–3 cords slightly stronger and more widely spaced. Umbilicus very narrow, chink-like, partially or completely filled by columella. Aperture subquadrate to subovate, lips thin, finely crenulate; columella concave, thickened, terminating in obscure, rounded denticle. Shell ground color ivory with greenish and reddish iridescence, irregular spots and flammules of brown above periphery, squarish spots of brown regularly spaced on periphery, and obscure, crescentic streaks of brown on base.

**Holotype:** MORG 29.291, height 8.5 mm, width 6.9 mm.

**Type locality:** Off Santana Island, Estado de Rio de Janeiro, Brazil, in 50–80 m.

**Paratypes:** 1, MCZ 302592; 1, FSBC 144068; from same lot as holotype.

**Other material:** 2, Coltro collection; from same lot as holotype.—1, Sunderland collection; off Rio de Janeiro, Brazil, 50–70 m; trawled by shrimpers.

**Distribution:** At present, *Calliostoma brunneopictum* is known only from off Rio de Janeiro, Brazil, in depths of 50–80 m. Living specimens are also known from 50–80 m.

**Remarks:** Shells of *Calliostoma brunneopictum* are most similar to those of *C. roseolum* but differ by having a larger protoconch (365–375  $\mu$ m vs. 325  $\mu$ m); by having more numerous, more finely beaded spiral cords; by having an umbilical chink; and by having crescentic streaks of brown on the base. Differences between *C. brunneopictum* and the similar *C. viscardii* are discussed in the Remarks section of the latter species.

*Calliostoma viscardii* new species  
(figures 21, 22, 108)

**Figures 11–14.** *Calliostoma cnidophilum* new species. **11, 12.** Holotype, USNM 860265; height 13.7 mm, width 11.4 mm. **13, 14.** Specimen from off Barbados, Sunderland collection; height 11.2 mm, width 9.2 mm. **Figures 15, 16.** *Calliostoma semisuave* new species, holotype, USNM 860252; height 13.4 mm, width 11.4 mm. **Figures 16–20.** *Calliostoma brunneopictum* new species. **17, 18.** Holotype, MORG 29.291; height 8.5 mm, width 6.9 mm. **19, 20.** Paratype, FSBC 144068; height 7.5 mm, width 6.0 mm. **Figures 21, 22.** *Calliostoma viscardii* new species, holotype, MORG 29.292; height 10.9 mm, width 8.2 mm.

**Description:** Shell small to medium-sized, attaining height of 13.0 mm, width of 10.8 mm, conical, non-umbilicate, finely sculptured. Protoconch 300–335  $\mu\text{m}$  maximum diameter, 1 whorl, tip violet. Teleoconch whorls 8.25, flat to weakly convex; first whorl with 2 strong, smooth to weakly beaded spiral cords, initially lacking axial sculpture but developing low, rounded riblets near end of whorl, riblets persisting on subsequent whorls as low folds between spiral cords; spiral sculpture increasing by intercalation to 7–8 cords and 2–6 threads, of which abapical 2 spiral cords forming periphery, cords rather coarsely beaded, beads rounded, slightly spirally elongate on last 2 whorls; periphery rather sharp on first 5 whorls, becoming narrowly rounded on last 2 whorls, peripheral cords adpressed. Base weakly convex, with 13–16 narrow, weakly beaded spiral cords. Aperture subquadrate to subovate, lips thin, finely crenulate; columella concave, thickened, terminating in obscure, rounded denticle. Shell ground color tan with greenish and reddish iridescence, patches and flammules of brown and occasional white spots on and above periphery, and elongate spots of brown on basal cords. Animal (in alcohol): foot dark brown with white papillae; mantle edge with irregular band of brown, mantle mottled black and white posteriorly; head mottled black and white; cephalic tentacles short, stout, tapering rapidly to narrow tip; eye-stalks short (but about 40% tentacle length), stout, with large, black eye at tips; snout mottled with brown and white, longer than broad, slightly longer than cephalic tentacles, slightly tapered at tip, tip with fringe of fine, rather long papillae; epipodium with 4 pairs of short, stout tentacles; left neck lobe seems to be smooth, right lobe finely digitate.

**Holotype:** MORG 29.292, height 10.9 mm, width 8.2 mm.

**Type locality:** Between Ilha de São Sebastião and Ilha de Buzias, off São Paulo, Estado de São Paulo, Brazil, in 40–45 m.

**Paratypes:** 1, USNM 860253; 1, FSBC 1 44066; from same lot as holotype.

**Other material:** 3, Coltro collection; off Guarapari, Estado de Espírito Santo, Brazil, 20–30 m; trawl; July 1991.—6, Coltro collection; off Ilha de São Sebastião, Estado de São Paulo, Brazil, 30–35 m; dredge; J. & M. Coltro & L. F. Viscardi, collectors.

**Distribution:** *Calliostoma viscardii* is known from southeastern Brazil (Guarapari to São Paulo) in depths of 20–45 m; living specimens have been collected in depths of 30–45 m.

**Remarks:** Shells of this species resemble those of *Calliostoma brunneopictum* but differ by having a smaller protoconch (300–335  $\mu\text{m}$  vs. 365–375  $\mu\text{m}$ ) with a violet tip; by having stronger, more widely spaced spiral cords whose beads are large and rounded rather than small and conical; by having the whorl periphery composed of a pair of close-set spiral cords abapical to the cord

that is the continuation of the abapical cord on the first whorl, whereas the abapical cord on the first whorl of *C. brunneopictum* forms the periphery on all whorls; and by having less well-defined beading on the basal spiral cords. *Calliostoma viscardii* is also similar to *C. roseolum*, but the shells have a larger protoconch (335–350  $\mu\text{m}$  vs. 300–335  $\mu\text{m}$ ); lack the prominent, broadly rounded whorl periphery; have stronger, more widely spaced spiral cords above the periphery; and have slightly larger but less discrete beading. The radula of *C. viscardii* (formula  $\infty.5.1.5.\infty$ ; figure 108) does not differ significantly from that of *C. pulchrum* illustrated by Clench and Turner (1960:pl. 3, fig. 3).

This species is named *viscardii* to recognize the contributions of Sr. Luiz Francisco Viscardi to Brazilian malacology.

*Calliostoma bermudense* new species  
(figures 23, 24)

**Description:** Shell small to medium-sized, attaining height of 12.6 mm, width of 8.9 mm, conical, nonumbilicate, finely sculptured. Protoconch 315–325  $\mu\text{m}$  maximum diameter, 1 whorl. Teleoconch whorls about 8, flat to weakly concave; first whorl with low, rounded axial riblets and 2 strong, beaded spiral cords; axial sculpture weakening rapidly at end of second whorl, absent thereafter; spiral sculpture increasing by intercalation to 8–10 cords and 1–4 threads, of which abapical 2–3 cords forming periphery, cords strongly beaded; periphery of first 3–4 whorls sharply angulate, that of subsequent whorls broadly rounded, not distinctly set off from base. Base flat to weakly convex, with 10–14 narrow, weakly beaded spiral cords of which 1–3 markedly weaker. Aperture subquadrate to ovate, thickened within, lips thin, crenulate; columella short, almost straight, thickened. Shell ground color yellowish brown, spiral cords brown, often broken into dashed lines on base, periphery often with diffuse patches of brown to red-brown, apical 3–4 whorls pinkish brown.

**Holotype:** DMNH 187591, height 11.9 mm, width 8.9 mm.

**Type locality:** Off Castle Roads, Bermuda, in 82 m.

**Paratypes:** 9, DMNH 187592; 2, USNM 860269; 1, FSBC 1 42541; all from same lot as holotype.

**Distribution:** *Calliostoma bermudense* is known only from the type locality; no living specimens are known.

**Remarks:** Shells of *Calliostoma bermudense* are most similar to those of *C. roseolum* but differ by being relatively broader; by having narrower, more widely spaced and more finely beaded spiral cords; by having a flatter whorl profile after the fourth whorl; by having a proportionately shorter and thicker columella; by having brown or pinkish-brown apical whorls; and by having brown spiral cords.

*Calliostoma dentatum* new species  
(figures 25, 26)

**Description:** Shell small, attaining height of 8.4 mm, width of 7.4 mm, conical, nonumbilicate, finely sculptured. Protoconch 335–350  $\mu\text{m}$  maximum diameter, 1 whorl. Teleoconch whorls 8, flat to weakly concave; first 2 whorls with low, rounded axial riblets and 2 strong, beaded spiral cords; axial sculpture on remaining whorls of low, rounded, discontinuous axial threads, most distinct at periphery; spiral sculpture increasing by intercalation to 4–8 strongly beaded cords, of which abapical 2–3 spiral cords forming periphery; periphery angulate, adapical peripheral cord strongest, abapical 2 (when 3 present) weaker, closely appressed, set with axially elongate beads. Base flat, with 10–14 narrow, finely beaded spiral cords. Aperture subquadrate, lips thin, crenulate; columella straight, thickened. Shell ground color ivory with diffuse axial flammules of golden brown above periphery, and 2–3 spiral rows of discrete, spirally elongate spots of golden or reddish brown on base.

**Holotype:** USNM 859358, height 5.7 mm, width 5.2 mm.

**Type locality:** Off Freeport, Texas, approximately 28°05'N, 94°35'W, in 51 m.

**Paratypes:** 1, MCZ 297052; 1, LACM 2293; 1, HMNS 3946; NW Gulf Survey station, off Freeport, Texas, 51 m; trawl; A. Kight, collector.—1, HMNS 15866; 2, FSBC I 32301; NW Gulf Survey station, 2 mi south of #1 buoy, Heald Bank, 22 m; 22 August 1966; H. Geis and W. Pierce, collectors. Other paratypes and material (44 lots) are listed by Quinn (in press).

**Distribution:** *Calliostoma dentatum* is confined to the northwestern Gulf of Mexico, from the Mississippi River to off Port Isabel, Texas, and is usually collected from depths of 15–55 m; living specimens are known from depths of 12–51 m.

**Remarks:** *Calliostoma dentatum* is closely related to *C. pulchrum*, *C. roseolum*, and the Plio-Pleistocene *C. bowdenense* Woodring, 1928. Shells of *C. dentatum* differ from those of *C. pulchrum* by having a larger protoconch  $\bar{x}$  = 346  $\mu\text{m}$  vs. 300  $\mu\text{m}$ ; Quinn, in press; by having fewer spiral cords both above and below the periphery; and by having the beads on the cords stronger, more sharply defined, and laterally compressed. Shells of *C. dentatum* differ from those of *C. roseolum* by having a larger protoconch  $\bar{x}$  = 346  $\mu\text{m}$  vs. 324  $\mu\text{m}$ ), by being relatively narrower, by having a narrower and more angulate periphery, and by having laterally compressed beads on the spiral cords. Shells of *C. dentatum* differ from those of *C. bowdenense* by having more numerous spiral cords above the periphery; by having a narrower, more sharply angulate periphery; and by having weaker, more weakly beaded spiral cords on the base. The radula of *C. dentatum* (formula  $\infty.4.1.4.\infty$ ) differs from that of *C. pulchrum* illustrated by Clench and

Turner (1960:pl. 3, fig. 3) by having four rather than five lateral teeth.

*Calliostoma tenebrosum* new species  
(figures 27, 28)

**Description:** Shell medium-sized, attaining height of 13.6 mm, width of 11.5 mm, conical, nonumbilicate, finely sculptured. Protoconch slightly chipped, about 325  $\mu\text{m}$  maximum diameter, 1 whorl. Teleoconch whorls 7.9, flat; first 3 whorls with low, rounded axial riblets and 2–4 strong, beaded spiral cords; axial riblets weakening on fourth whorl, becoming weak, irregular folds on subsequent whorls; spiral sculpture increasing by intercalation to 7 cords and 1 thread, of which abapical 3 cords forming periphery, beads on cords strong, rounded; periphery rather broadly rounded, adapical 2 peripheral cords strongest, subequal, separated by rather broad groove. Base very weakly convex, with 13 narrow, finely beaded spiral cords. Aperture subquadrate, moderately thickened within, lips thin, crenulate; columella very weakly concave, thickened, terminating in rounded tubercle. Shell ground color tan with spots of white and spots and axial streaks of dark brown.

**Holotype:** ANSP 300356, height 13.6 mm, width 11.5 mm.

**Type locality:** Off Potengi River, Natal, Estado Rio Grande do Norte, Brazil, depth unrecorded.

**Distribution:** This species is known only from the holotype, a hermit-crabbed shell, collected from a bottom of black mud in an unrecorded depth.

**Remarks:** *Calliostoma tenebrosum* is readily distinguished from other species of the *C. pulchrum* group by the relatively large, darkly colored shell that has the whorl periphery composed of three widely spaced spiral cords; the beads on the spiral cords are unusually large for this species group.

*Calliostoma moscatellii* new species  
(figures 29, 30, 109)

*Calliostoma carcellesi*: Rios, 1970:25, pl. 4 (partim); 1975:23, pl. 6, fig. 61 (partim). (Non *Calliostoma carcellesi* Clench & Aguayo, 1940).

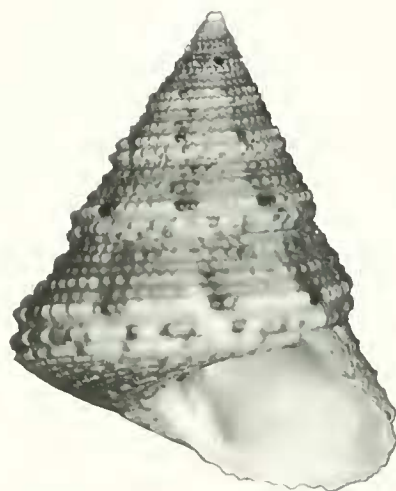
*Calliostoma* (*Neocalliostoma*) *carcellesi*: Rios, 1985:22, pl. 10, fig. 88 (partim).

**Description:** Shell medium-sized, attaining height of 27.7 mm, width of 17.9 mm, conical, nonumbilicate, rather coarsely sculptured. Protoconch 375  $\mu\text{m}$  maximum diameter, 1 whorl. Teleoconch whorls about 10, flat to weakly convex; first whorl with weak, rounded axial riblets and 2 strong, beaded spiral cords; axial riblets replaced on subsequent whorls by low, rounded, crowded plicae in interspaces between spiral cords, plicae strongest near suture and below peripheral cord; spiral sculpture increasing by intercalation to 5–8 cords and 4–9 threads, of which abaxial 2–3 strong cords and 2–3 weak





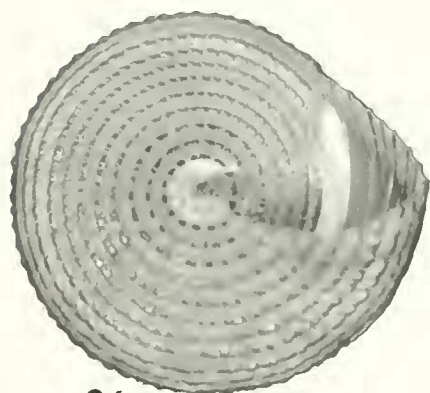
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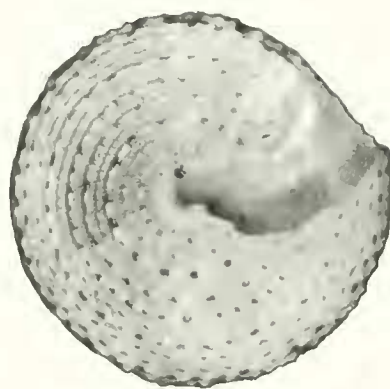
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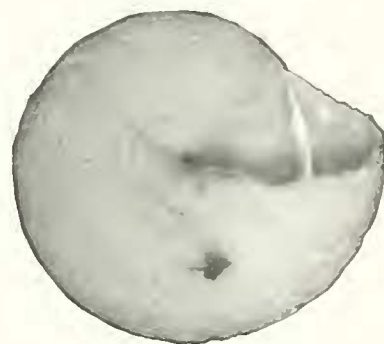
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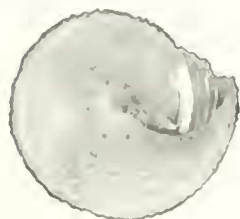
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cords or threads forming periphery, cords rather coarsely beaded, beads rounded, spirally elongate; periphery narrowly rounded. Base weakly convex, with 24–27 narrow, smooth to weakly beaded spiral cords and threads. Aperture subquadrate, lips thin, crenulate; columella short, straight, thickened. Shell ground color light yellowish or pinkish tan with greenish iridescence, diffuse patches of tan to reddish brown, and occasional discrete spots of light brown; 2–5 basal spiral cords with elongate spots of brown; protoconch and first 2 whorls lilac. Animal (in alcohol) white except brown sides of snout; cephalic tentacles long, broad, tapering abruptly near tip, ocular peduncles short (about 20% tentacle length), with large, black eye at tips; snout broad at base, tapering to rounded tip, tip with fringe of very small, short papillae; epipodium with 1 tentacle on left, 2 on right, left larger than right, neck lobes well developed, thin, semicircular, smooth.

**Holotype:** MORG 29.293, height 25.9 mm, width 17.7 mm.

**Type locality:** Off Ilha de Santana, Estado de Rio de Janeiro, Brazil, in approximately 50–80 m.

**Paratypes:** 1, USNM 860254; 1, MCZ 302591; 1, ANSP 389337; 1, FSBC 1 44075; 1, UF 189458; all from same lot as holotype.

**Other material:** 5, Coltro collection; from same lot as holotype.

**Distribution:** Numerous specimens of *C. moscatellii*, including live-collected specimens, have been obtained from depths of 50–200 m off Rio de Janeiro, Brazil, by shrimpers.

**Remarks:** Shells of *Calliostoma moscatellii* are very similar to those of *C. earcellesi* (figures 31, 32) but differ by being markedly narrower; by having a smaller protoconch (375  $\mu$ m vs. 400–425  $\mu$ m); by having fewer basal spiral cords, most of which are weakly but discretely beaded; by having more strongly spirally elongate beads on the suprapерipheral spiral cords; by having lilac apical whorls; and by having a distinct color pattern. *Calliostoma moscatellii* is also similar to *C. jucundum* but has narrower shells with more numerous, narrower spiral cords that bear much smaller, spirally elongate beads. The radula of *C. moscatellii* (formula  $\infty.6.1.6.\infty$ ; figure 109) resembles that of *C. pulchrum* illustrated by Clench and Turner (1960:pl. 3, fig. 3) but has a broader rachidian tooth, and the cusps of the rachidian and lateral teeth are more finely denticulate.

This species is named for Sr. Renato Moscatelli, in recognition of his support of malacological publications in Brazil.

*Calliostoma apicinum* Dall, 1881  
(figures 33, 34)

*Calliostoma apicinum* Dall, 1881:46; 1889b:162, pl. 24, figs. 3, 3a.—Pilsbry, 1890:379, pl. 60, figs. 1, 2.—Johnson, 1934:69.

*Calliostoma (Calliostoma) apicinum*: Dall, 1889a:366, pl. 24, figs. 3, 3a

*Calliostoma roseolum*: Clench & Turner, 1960:19, pl. 15, figs. 1, 2 (partim).—Abbott, 1974:43 (partim).—Quinn, 1979:26 (partim).—Sander & Lalli, 1982:table 4 (Non *Calliostoma roseolum* Dall, 1881).

**Description:** See Dall (1881:46).

**Lectotype:** (by implication of holotype; Clench & Turner, 1960): USNM 95013, height 7.7 mm, width 6.7 mm.

**Type locality:** Off Barbados, BLAKE station (number and coordinates unrecorded), in 183 m.

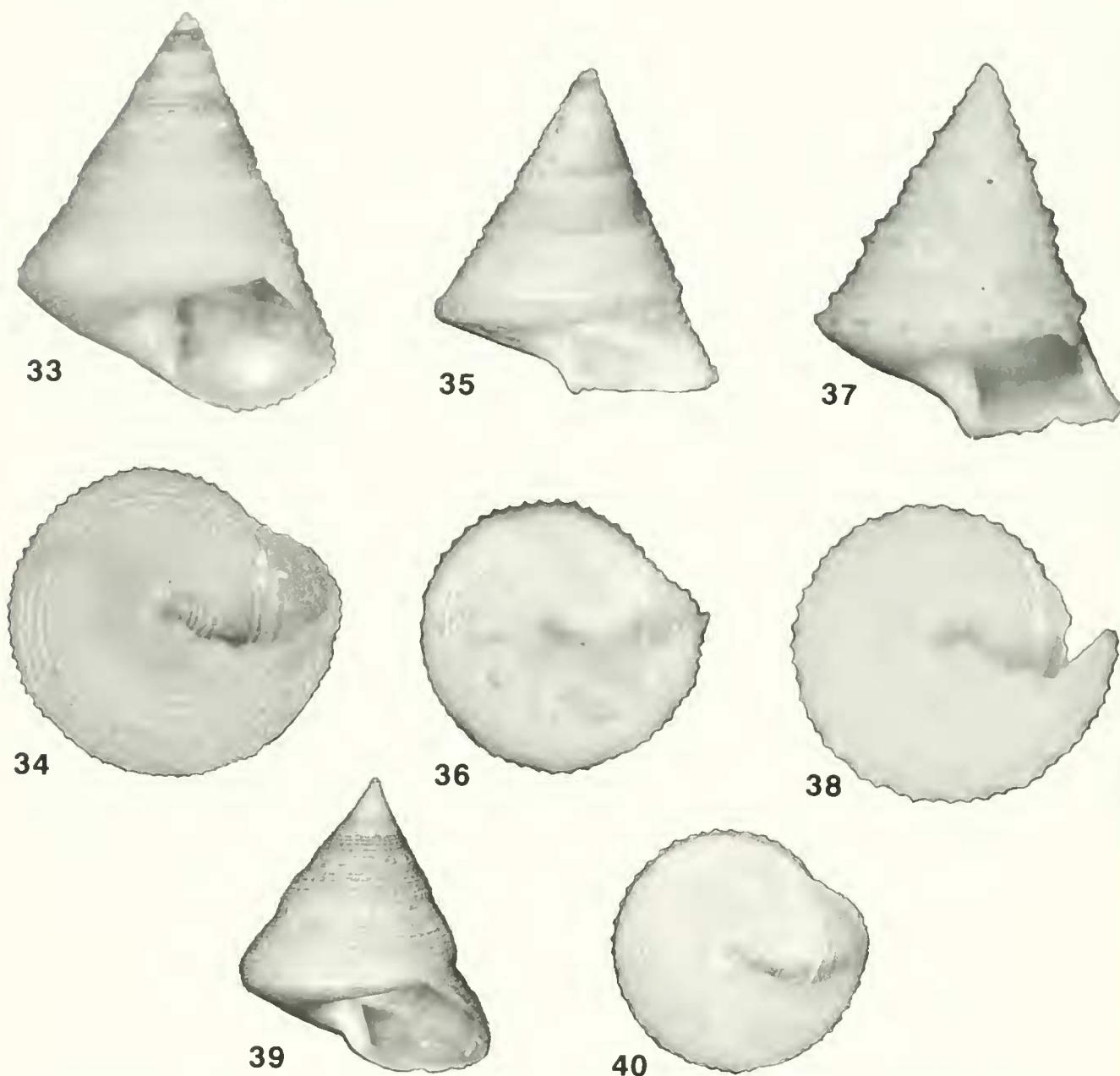
**Paralectotypes:** 1, USNM 95012; off Barbados, BLAKE Station 290, 13°11'54"N, 59°39'45"W, 134 m; 9 March 1879.—2, MCZ 7564; BLAKE station (number and coordinates unrecorded), 183 m.

**Other material:** 1, ANSP 353528; 1, FSBC 1 44077; off Hometown, Barbados, 175–225 m; ex F. Sander.—5, Sunderland collection; off St. James, Barbados, 100 m; dredge; ex F. Sander.—1, Sunderland collection; off St. James, Barbados, 152 m; 1988; ex F. Sander.—6, Sunderland collection; off St. James, Barbados, 175–225 m; ex F. Sander.—Several other specimens, all from Barbados, in private collections.

**Distribution:** This species is known only from off Barbados in depths of 100–225 m; I have only seen one live-collected specimen from a depth of 100 m.

**Remarks:** This species was synonymized with *Calliostoma roseolum* by Clench and Turner (1960), who thought that the shells described by Dall as *C. apicinum* were merely juveniles of *C. roseolum*. Shells of *C. apicinum*, however, are distinguished from those of *C. roseolum* by retaining flat-sided, peripherally subangulate whorls as adults (7+ whorls) rather than by having concave whorls with broadly rounded peripheries after the third or fourth whorl; by having a larger protoconch (360–375  $\mu$ m vs. 300–330  $\mu$ m) that has a purplish-brown tip; by having the apical two teleoconch whorls brown or purplish brown; by having more widely spaced, smooth

**Figures 23, 24.** *Calliostoma bermudense* new species, holotype, DMNH 187591; height 11.9 mm, width 8.9 mm. **Figures 25, 26.** *Calliostoma dentatum* new species, holotype, USNM 859358; height 5.7 mm, width 5.2 mm. **Figures 27, 28.** *Calliostoma tenebrosus* new species, holotype, ANSP 300356; height 13.6 mm, width 11.5 mm. **Figures 29, 30.** *Calliostoma moscatellii* new species, holotype, MORG 29.293; height 25.9 mm, width 17.7 mm. **Figures 31, 32.** *Calliostoma earcellesi* Clench & Aguayo, 1940, holotype, MCZ 104719; height 20.5 mm, width 17.5 mm.



Figures 33, 34. *Calliostoma apicinum* Dall, 1881, specimen from off Barbados, FSBC 1 44077; height 10.0 mm, width 8.2 mm. Figures 35, 36. *Calliostoma debile* new species, holotype, USNM 860255; height 8.1 mm, width 7.0 mm. Figures 37, 38. *Calliostoma indiana* Dall, 1889, specimen from off Honduras, FSBC 1 44071; height 10.4 mm, width 9.0 mm. Figures 39, 40. *Calliostoma orion* Dall, 1881, specimen from JOHN ELLIOTT PILLSBURY Station P-425, UMMIL 30.3635; height 16.2 mm, width 14.4 mm.

or very weakly beaded spiral cords on the outer two-thirds of the base; by often having a chink-like umbilicus; and by having a shorter columella that often has a sub-conical, medial swelling. *Calliostoma apicinum* seems to be most closely related to the sympatric *C. debile* (see Remarks under the latter species for comparisons). Specimens that I can assign unequivocally to *C. apicinum* seem to come only from Barbados. Some other specimens with similar morphologies from the Bahama Islands (MCZ uncatalogued) and northwestern Cuba (MCZ 7566) are not here considered conspecific with the Barbados spec-

imens. A paralectotype of *C. apicinum* (MCZ 7565) from off Havana, Cuba, is definitely not this species; the specimen has a uniquely undulate peripheral spiral cord on several of the adapical teleoconch whorls and probably represents an undescribed species.

*Calliostoma debile* new species  
(figures 35, 36)

**Description:** Shell small to medium-sized, attaining height of 10.3 mm, width of 8.7 mm, conical, nonum-

bilicate, finely sculptured. Protoconch 350–365  $\mu\text{m}$  maximum diameter, 1 whorl. Teleoconch whorls 7.7, flat; first 2 whorls with low, rounded axial riblets and 2 strong, beaded spiral cords, abapical cord stronger on first 4 whorls, set with strong, conical beads; axial sculpture absent on subsequent whorls; spiral sculpture increasing by intercalation to 7–10 cords and 0–3 threads, of which abaxial 3, sometimes 2, cords forming periphery, supra-peripheral cords fine, sharp, finely beaded; periphery subcarinate, slightly projecting, peripheral cords stronger than suprapерipheral cords, set with conical beads. Base flat, with 10–14 narrow, flattened, smooth to weakly rugose spiral cords and 2–3 threads or weak cords near periphery. Aperture subquadrate, lips thin, weakly crenulate; columella straight, thickened. Shell ground color ivory, periphery light pinkish brown or with pale to bright spots of pinkish or yellowish brown or clear rose.

**Holotype:** USNM 860255, height 8.1 mm, width 7.0 mm.

**Type locality:** Off St. James, Barbados, in 175–225 m.

**Paratype:** 1, FSBC I 45776; off St. James, Barbados, 152 m; dredge; *ex* F. Sander.

**Other material:** 4, Sunderland collection; off St. James, Barbados, 152 m; 1988; dredge; *ex* F. Sander.—6, Sunderland collection; off St. James, Barbados, 175–225 m; dredge; *ex* F. Sander.

**Distribution:** *Calliostoma debile* is known only from empty shells collected off Barbados in 152–225 m.

**Remarks:** Shells of *Calliostoma debile* are most similar to those of the sympatric *C. apicinum* but differ by having a slightly smaller protoconch; by lacking the brown or purplish-brown apical whorls; by having a more projecting periphery, usually composed of three (sometimes two) close-set spiral cords; by usually having two to three spiral threads or weak cords between the circumbasal cord and the outermost strong basal spiral cord; by having distinct radial threads that finely bead the basal spiral cords; by having a less-thickened columella that lacks any indication of a medial swelling; and by lacking strong ridges within the aperture.

*Calliostoma indiana* Dall, 1889  
(figures 37, 38)

*Calliostoma (Eucasta) indiana* Dall, 1889a:368, pl. 32, figs. 3, 5.—Abbott, 1974:46, fig. 333.

*Calliostoma indiana*: Clench & Turner, 1960:52, pl. 34, fig. 1.

**Description:** See Dall (1889a:368) and Clench and Turner (1960:52).

**Holotype:** USNM 214273, height 7.9 mm, width 6.9 mm.

**Type locality:** Off Grenada, Lesser Antilles, BLAKE Station 247, 12°05'25"N, 61°47'15"W, in 311 m.

**Other material:** 1, FSBC I 44071; off Honduras, CAPE

HATTERAS station, 15°32.36'N, 81°39.80'W, 50–85 m; 8 April 1987; rock dredge.

**Distribution:** This species is now known from two specimens, the holotype from Grenada and the CAPE HATTERAS specimen from off Honduras. Based on knowledge of the distributions of other species of *Calliostoma* (Clench & Turner, 1960, Quinn, herein, in press), I believe *C. indiana* probably inhabits deep fore-reef areas (50–150 m) of Central America and the Greater and Lesser Antilles.

**Remarks:** The new shell reported here is larger than the holotype (height 10.4 mm, width 9.0 mm), has five rather than four strong suprapерipheral cords, and has ten rather than seven basal spiral cords; otherwise the two shells are very similar. Based on shell characters, this species clearly belongs to the *C. pulchrum* species complex and is most similar to *C. echinatum*, *C. orion*, *C. sapidum*, and *C. cinctellum*.

*Calliostoma orion* Dall, 1889  
(figures 39, 40)

*Calliostoma orion* Dall, 1889a:367, pl. 28, fig. 2; 1889b:162.—Pilsbry, 1890:383, pl. 48, fig. 18.—Johnson, 1934:70.—Clench & Turner, 1960:54, pl. 35, figs. 1, 2.—Quinn, 1981:151, figs. 1–13.

**Description:** See Dall (1889a:367) and Quinn (1981:151).

**Holotype:** USNM 214272, height 4.6 mm, width 4.3 mm.

**Type locality:** Off Havana, Cuba, BLAKE Station 62, in 146 m.

**Other material:** 2, FSBC I 31518; off western end of Isla de Roatán, Honduras, 19.8 m; 15 September 1982; SCUBA collection by W. C. Jaap.—1, Crnkovic collection; off western end of Isla de Roatán, Honduras, approximately 30 m; 1990; SCUBA collection by L. A. Crnkovic.—1, UMML 30.5688; off Isla de Roatán, Honduras, JOHN ELLIOTT PILLSBURY Station P-629, 15°58.2'N, 86°09.0'W, 40 m; 21 March 1968; 40-ft otter trawl.—1, UF 36324; Isla de Providencia, Colombia (off Nicaragua), "shallow water"; August 1971; C. R. Gilbert, collector.—1, UMML 30.3635; off Punta Manzanillo, Panamá, JOHN ELLIOTT PILLSBURY Station P-425, 9°38.9'N, 79°15.3'W, 70–64 m; 19 July 1968; 10-ft otter trawl.—3, Sunderland collection; off Barbados; *ex* F. Sander.

**Distribution:** *Calliostoma orion* is now known from almost the entire Caribbean coast of Central America, Cuba, the Bahama Islands, and Barbados.

**Remarks:** I discussed the ecology, shell and radular morphologies, and other distributional records in a previous paper (Quinn, 1981). The present specimens increase the maximum known size to 20.2 mm high, 17.1 mm wide; extend the maximum depth from which living specimens have been obtained from 43 m to 64–70 m;



and add new collection localities off Honduras, Nicaragua, and Panamá.

*Calliostoma fernandesi* Princz, 1978  
(figures 41, 42)

*Calliostoma fernandesi* Princz, 1978:152–154, figs. 1, 2.

**Description:** Shell large, attaining height of 28.5 mm, width of 25.5 mm, conical, umbilicate, finely sculptured. Protoconch 350–375  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls more than 10, flat to concave; first 2 whorls flat-sided, with low, rounded axial riblets and 2–4 finely beaded spiral cords; axial sculpture absent on subsequent whorls; spiral cords increasing by intercalation to 17–22, of which abapical 3–4 cords forming periphery, all cords subequal and with well-defined, close-set, rounded beads; periphery narrowly rounded. Base flat to weakly convex, with 17–28 finely beaded spiral cords, those near periphery narrow, sharp, cords becoming broader and flatter adaxially, often splitting into 2 subequal cords; circumumbilical 1–2 cords strongest, tuberculate. Umbilicus funnel-shaped, 17%–24% maximum shell diameter, wall almost vertical, white. Aperture subquadrate, thickened within and with strong, sharp ridges, lips thin, crenulate; columella weakly sigmoid, thickened, terminating in blunt, rounded tubercle. Shell ground color cream to straw with irregular, diffuse patches of light brown above periphery; periphery with regular series of squarish, rose-brown to brown spots; interspaces of suprapерipheral spiral cords golden brown; base finely mottled with cream and yellow-brown.

**Holotype:** Collection of “Familia Fernández en Maracay, Estado Aragua, Venezuela” (Princz, 1978:152), height 14.7 mm, width 15.8 mm.

**Type locality:** “Grottos” at Las Cuevas Beach, Trinidad, depth not reported.

**Other material:** 1, UMML 30.7162; off Península de la Guajira, Colombia, JOHN ELLIOTT PILLSBURY Station P-769, 12°31.0'N, 71°41.0'W, 143–146 m; 28 July 1968; 10-ft otter trawl.—1, UMML 30.6424; off Península de Paria, Venezuela, JOHN ELLIOTT PILLSBURY Station P-709, 11°08.8'N, 62°46.1'W, 46 m; 19 July 1968; 10-ft otter trawl.—1, UMML 30.6454; off Península de Paria, Venezuela, JOHN ELLIOTT PILLSBURY Station P-708, 11°24.7'N, 62°40.5'W, 69–73 m; 19 July 1968; 10-ft otter trawl.—1, UMML 30.6373; off Península de Paria, Venezuela, JOHN ELLIOTT PILLSBURY Station P-707, 11°21'N, 62°21'W, 75 m; 19 July 1968; 10-ft otter trawl.—1, UMML 30.6373; off Península de Paria, Venezuela, JOHN ELLIOTT PILLSBURY Station P-705, 10°45'N, 62°00'W, 77–86 m; 18 July 1968; 10-ft otter trawl.—2, MCZ 273512; Georgetown, Guyana, CHAIN Cruise 35, Station 35+36, 8°10.5'–8°10.0'N, 57°48'W, 97–110 m; 28 April 1963.—2, USNM 866503; 1, FSBC 1 44072; 1, UF 189459; 5, UMML 30.5840; off Pointe Isère, French Guiana, JOHN ELLIOTT PILLSBURY Station P-650, 6°07'N, 52°19'W, 84–91 m; 8 July 1968; 10-ft otter trawl.

**Distribution:** *Calliostoma fernandesi* occurs from Suriname northward and westward to off Cabo de la Vela, Colombia, in depths of about 45–245 m; living specimens have been collected from depths of 84–146 m.

**Remarks:** Although the description presented by Princz (1978) is incomplete, the specimens recorded here seem to be referable to *Calliostoma fernandesi*. The shells of this species are very similar to those of *C. scalenum* but differ by having a larger protoconch (375  $\mu$ m vs. 320–325  $\mu$ m); by having fewer, stronger, more evenly sized spiral cords; by having stronger, more closely spaced, and more symmetrical beading; by having an umbilical wall that is almost vertical rather than sloping steeply inward; and by having a different, lighter color pattern. The spiral cords at the periphery and on the base of shells of *C. fernandesi* tend to increase in number by fission of existing cords rather than by intercalation of new cords; this tendency is rare among species of *Calliostoma* that I have examined.

Data obtained from the original field data sheets indicate that *C. fernandesi* occurs on shell-hash and coral-rubble bottoms, often in association with sponges and octocorals.

*Calliostoma scalenum* new species  
(figures 43, 44, 110, 111)

**Description:** Shell large to very large, attaining height of 40.6 mm, width of 34.2 mm, conical, umbilicate, finely sculptured. Protoconch 320–325  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls about 10, first 4–5 whorls flat-sided, subsequent whorls weakly to strongly concave; first 3 whorls with low, rounded axial riblets and 2–6 finely beaded spiral cords; axial sculpture absent on subsequent whorls; spiral cords increasing by intercalation to 25–30, of which abapical 8–12 cords forming periphery, alternating in size, finely beaded, beads close-set, rounded, conical; periphery narrowly rounded. Base flat to weakly convex, with as many as 42 narrow, weakly beaded spiral cords, those on abaxial half alternating in size, those on adaxial half subequal except 2–3 stronger, tuberculate circumumbilical cords. Umbilicus funnel-shaped, 14%–23% maximum shell diameter, wall smooth, white, often with yellow-brown flush. Aperture subquadrate, thickened within and with strong ridges, lips thin, crenulate; columella sigmoid, thickened, terminating in blunt, rounded tubercle. Shell ground color light chestnut to red-brown with irregular, diffuse axial flammules of darker ground color and white; light and dark flammules more distinct and closely spaced on periphery. Animal (in alcohol) white; foot with numerous, scattered, small, opaque, white spots; cephalic tentacles long, tapered, bases with short ocular peduncles bearing small, black eye at tips; epipodium with 4 pairs of tentacles, neck lobes well-developed, thin, semicircular, smooth-edged.

**Holotype:** USNM 859356, height 31.5 mm, width 25.9 mm.



**Type locality:** Stetson Bank, southeast of Galveston, Texas, 28°09'54"N, 94°18'00"W, in 21–27 m.

**Paratypes:** 2, HMNS 15022; 2, USNM 859357; 1, MCZ 297051; 1, ANSP 367152; 1, AMNH 225980; 1, LACM 2292; 1, UF 110222; 2, FSBC 132315; 34, HMNS 15850; all from same lot as holotype.—3, ANSP 338470; off Freeport, Texas, NW Gulf Survey station, 28°10'N, 94°55'W, 51 m; dredge; A. Kight, collector.

**Other material:** More than 200 lots listed by Quinn (in press).

**Distribution:** *Calliostoma scalenum* inhabits offshore waters on calcareous substrates from North Carolina southward through the Florida Keys and throughout the Gulf of Mexico in depths of 25–80 m.

**Remarks:** Shells of *Calliostoma scalenum* have been identified previously as *C. jujubinum* without exception (see Quinn, in press, for complete synonymy). *Calliostoma scalenum* differs from *C. jujubinum* by having shells that are larger and more narrowly conical; that have a slightly larger protoconch (320–325  $\mu\text{m}$  vs. 315  $\mu\text{m}$ ); that lack fine, collabral threads after the fourth or fifth whorls; that have two rather than three distinct sizes of spiral cords with discrete, symmetrical rather than spirally elongate beads; that have a greater number of spiral cords, particularly on the base (35–42 vs. 25–30 total); and that lack very dark-colored apical whorls. Shells of *C. scalenum* are also similar to those of *C. tampaense* but differ by having straight-sided apical whorls that lack a strong, sharply beaded peripheral carina; by having finer, more numerous, and more finely beaded spiral cords; and by being proportionately much narrower. Both *C. jujubinum* and *C. tampaense* are also shallow-water species, neither species occurring alive in depths exceeding 11 m (Quinn, in press). The radula of *C. scalenum* (formula  $\infty.6.1.6.\infty$ ; figures 110, 111) is very similar to that of *C. tampaense* illustrated by Clench and Turner (1960:pl. 5, fig. 2, as *C. jujubinum*) and *C. vinosum* (figure 114 herein) in having six pairs of lateral teeth, of which the outer two pairs lack cusps. Radulae of *C. jujubinum* (figure 112) and *C. cubense* (figure 113) are also very similar in morphology but differ in having only five pairs of lateral teeth. One character common to all of these radulae is that the cusps of the inner lateral teeth arise from the outer corner of the tooth bases; this characteristic has not been explicitly noted before and is not clear in any of the previously published line drawings (Clench & Turner, 1960:pl. 5, figs. 1, 2; Calvo, 1987: fig. 26).

*Calliostoma cubense* new species  
(figures 45, 46, 113)

**Description:** Shell medium-sized, attaining height of 16.6 mm, width of 14.3 mm, conical, umbilicate, rather coarsely sculptured. Protoconch about 350  $\mu\text{m}$  maximum diameter, 1 whorl. Teleoconch whorls 7–8, flat to weakly concave; first 2–3 whorls with low, sharp axial riblets and

2–4 strong, beaded spiral cords; axial riblets replaced by low, crowded, rounded axial threads in interspaces between primary spiral cords; spiral cords increasing by intercalation to 6–12, of which abapical 1–2 beaded cords and broad, smooth cord forming periphery, usually alternating in size, primary cords strongly beaded, secondary cords smooth or finely beaded by axial threads; periphery narrowly rounded, smooth peripheral cord often dissected by 1 (rarely 3–5) fine, spiral stria. Base flat to weakly convex, with 10–13 narrow, smooth or weakly beaded spiral cords. Umbilicus funnel-shaped, 18%–21% maximum shell diameter, wall white. Aperture subquadrate, thickened within and with strong ridges, lips thin, crenulate; columella sigmoid, thickened, terminating in moderately strong, rounded denticle. Shell ground color tan to pinkish brown with numerous white dots, principally on individual beads of primary spiral cords but broader on periphery; interspaces between spiral sculpture golden brown, usually at periphery and on base, occasionally above periphery. Animal (reconstituted in trisodium phosphate) uniformly tan; cephalic tentacles long, slender, gradually tapering; eyestalks short (about 10%–15% tentacle length), stout, with large black eye at tips; snout longer than broad, with fringe of fine, short papillae; epipodium with 3 pairs of long tentacles; neck lobes well-developed, left lobe finely digitate, right lobe smooth-edged.

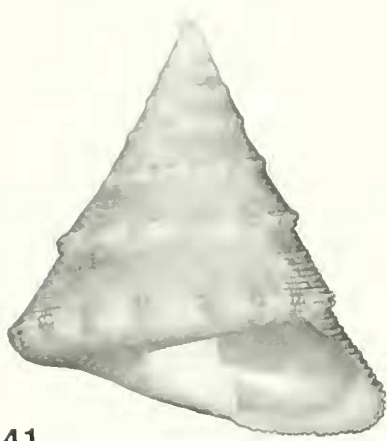
**Holotype:** ANSP 196933, height 14.7 mm, width 13.7 mm.

**Type locality:** Off Pini Pini, Cárdenas Bay, Matanzas, Cuba, in 11 m.

**Paratypes:** 4, USNM 438265; TOMÁS BARRERA Expedition Station 224, Cabo San Antonio, Pinar del Rio, Cuba.—12, ANSP 196926; off Cárdenas Bay, Matanzas, Cuba, 11 m; 11 February 1954; V. Conde, collector.—9, ANSP 357161; 2, FSBC 132405; from same lot as holotype.—2, MCZ 204705; Península de Hicacos, Matanzas, Cuba; 1940; V. Conde, collector.—4, MCZ 216120; Cayo Frago, Villa Clara, Cuba; R. Humes, collector.—1, MCZ 235536; off Cayo Frago, Villa Clara, Cuba; R. T. Abbott, collector.—8, MCZ 129623; Cayo Francés, Villa Clara, Cuba; ex P. J. Bermudez collection.—3, ANSP 216122; Caibarién, Villa Clara, Cuba; R. Humes, collector.

**Distribution:** This species seems to be restricted to the northern coast of Cuba; live-collected specimens were obtained from off Pini Pini in 11 m.

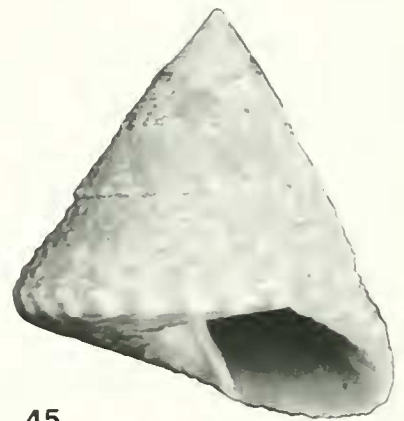
**Remarks:** Shells of *Calliostoma cubense* most resemble those of *C. adae* in shape and size and in having rather coarse sculpture relative to other species of the *C. jujubinum* species complex. Shells of *C. cubense* differ from those of *C. adae* by having more numerous, unequally sized spiral cords both above and below the periphery; by having the basal spiral cords closely spaced, separated by narrow, V-shaped grooves, rather than widely spaced and separated by broad, flat-bottomed



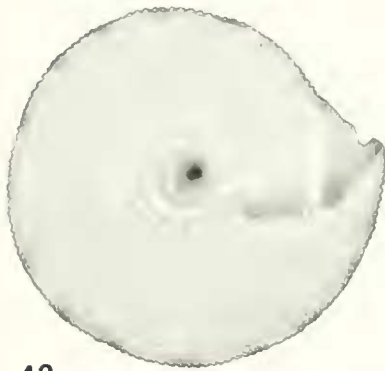
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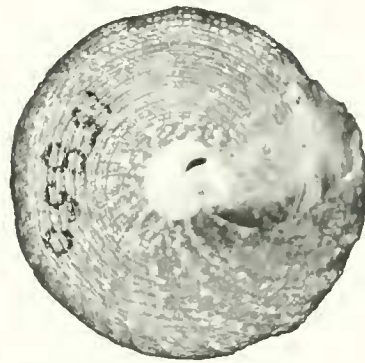
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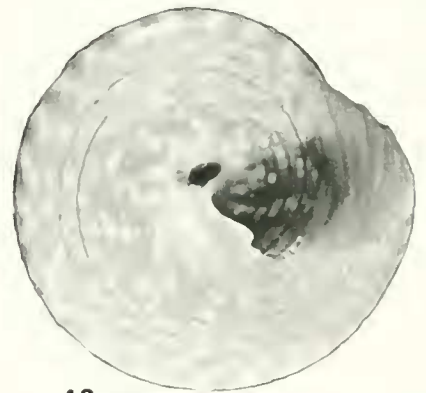
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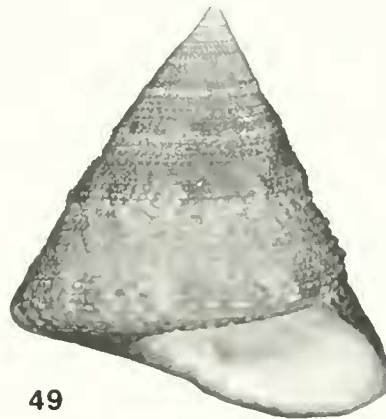
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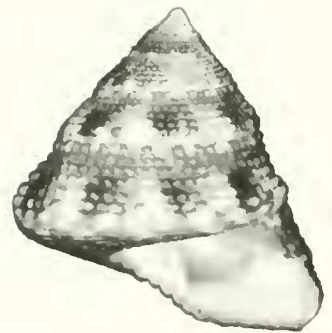
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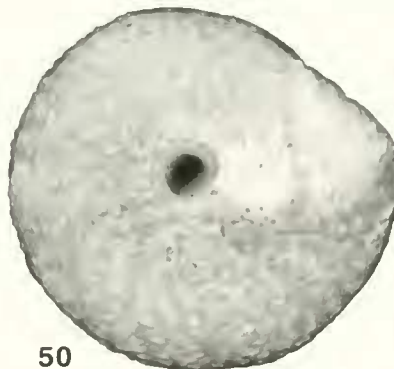
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52

grooves; by having distinct, fine collabral threads between the suprapерipheral spiral cords; and by having a rather broad and smooth rather than narrow and strongly beaded peripheral cord. The shells of *C. cubense* from the TOMÁS BARRERA Expedition (USNM 438265) are apparently those that Henderson (1916:185) recognized as "an apparently new *Calliostoma*" from dredgings off Cabo Cajón (near Cabo San Antonio) on a bottom of coral sand with patches of seagrass and sponge, the area swept by strong currents.

The intestine of one specimen (*ex* FSBC 1 32405) was packed with amorphous organic material, hydroid stalks, and several different forms of foraminiferans.

*Calliostoma purpureum* new species  
(figures 47–50)

**Description:** Shell medium-sized, attaining height of 23.9 mm, width of 20.2 mm, conical, umbilicate, rather coarsely sculptured. Protoconch unknown. Teleoconch whorls about 9, flat to weakly convex; first 1–2 whorls worn on all specimens but apparently with axial riblets and 2–4 spiral cords; axial sculpture absent on subsequent whorls; spiral sculpture increasing by intercalation to 8–14 cords and 1–8 fine threads, of which abapical 3–5 cords forming periphery; periphery broadly rounded. Base flat to weakly convex, with 13–18 coarsely beaded spiral cords. Umbilicus funnel-shaped, 18%–26% maximum shell diameter, wall white to intense violet. Aperture subquadrate, thickened within and with strong, sharp ridges, lips thin, crenulate; columella weakly sigmoid, thickened, often with 1–3 small, sharp denticles or ridges on lower third, terminating in strong, rounded tubercle. Shell ground color tan to reddish brown, mottled with cream to yellowish brown.

**Holotype:** USNM 860247, height 21.1 mm, width 19.6 mm.

**Type locality:** Off Cabo de la Vela, Colombia, in 61–91 m.

**Paratypes:** 3, USNM 860248; 1, FSBC 1 44074; from same lot as holotype.

**Other material:** 5, Deynzer collection; from same lot as holotype.—1, UMML 30.7204; off Cabo de la Vela, Colombia, JOHN ELLIOTT PILLSBURY Station P-773, 12°17.0'N, 72°15.0'W, 60–64 m; 29 July 1968; 10-ft otter trawl.—3 broken, FSBC 1 32742; about 5 km north of La Guardia, Isla de Margarita, Venezuela, beach drift; 19 November 1987; W. G. & C. B. Lyons, collectors.—15 broken, FSBC 1 32747; 6 km north of La Guardia,

Isla de Margarita, Venezuela, beach drift; 18 November 1987; W. G. & C. B. Lyons, collectors.—1, UMML 30.7269; off Galera Point, Trinidad, JOHN ELLIOTT PILLSBURY Station P-840, 10°40.5'N, 60°37.5'W, 33–37 m; 1 July 1969; 10-ft otter trawl.

**Distribution:** *Calliostoma purpureum* is known from off northeastern Colombia, Isla de Margarita, Venezuela, and Trinidad; most specimens have been collected from 33–91 m, but broken shells are also known from beach drift.

**Remarks:** Shells of *Calliostoma purpureum* are very similar to those of *C. jujubinum* but differ by lacking collabral threads between the spiral cords, by having the spiral cords narrower and more finely beaded, and by having the umbilical wall almost vertical rather than strongly sloped. Most specimens of *C. purpureum* have one or more small, sharp denticles on the columella, whereas specimens of *C. jujubinum* very rarely have only a single denticle; I know of no other species that has a denticulate columella. Additionally, whereas specimens of *C. jujubinum* may have the umbilical wall flushed with pinkish brown, I have never seen any specimen of that or any other species of western Atlantic *Calliostoma* with the violet color or the intensity of any other color displayed on the umbilical wall of specimens of *C. purpureum* except the red-brown in *C. brunneum* and *C. barbouri*. Shells of *C. purpureum* may have been reported from Curaçao by de Jong and Coomans (1988) as *C. tampaense*.

Almost all of the specimens collected at Isla de Margarita consisted of only the last one to three whorls; because the damage to these shells is almost identical to that illustrated by Vermeij (1978: fig. 2.10), this damage may have been the result of predation by xanthid crabs. This species has been collected principally in areas with large concentrations of sponges and was probably the species from Islas Los Roques, Venezuela, that Work (1969) observed eating an encrusting sponge.

*Calliostoma fucosum* new species  
(figures 51, 52)

**Description:** Shell medium-sized, attaining height of 12.8 mm, width of 12.6 mm, conicoturbinata, umbilicate, rather coarsely sculptured. Protoconch eroded. Teleoconch whorls about 7, weakly concave; first whorl eroded, next whorl with 3 strong, strongly beaded spiral cords; spiral cords increasing by intercalation to 7, of which abapical 2 cords forming periphery; periphery broadly rounded, adapical peripheral cord beaded, abapical pe-

**Figures 41, 42.** *Calliostoma fernandesi* Princz, 1978, specimen from JOHN ELLIOTT PILLSBURY Station P-650, UMML 30.5840; height 21.5 mm, width 19.3 mm. **Figures 43, 44.** *Calliostoma scalenum* new species, holotype from Stetson Bank, SE of Galveston, Texas, USNM 859356; height 31.5 mm, width 25.9 mm. **Figures 45, 46.** *Calliostoma cubense* new species, holotype from Pini Pini, Cuba, ANSP 196933; height 14.7 mm, width 13.7 mm. **Figures 47–50.** *Calliostoma purpureum* new species. **47, 48.** Holotype, USNM 860247; height 21.1 mm, width 19.6 mm. **49, 50.** Paratype, USNM 860248; height 15.8 mm, width 15.4 mm. **Figures 51, 52.** *Calliostoma fucosum* new species, holotype, USNM 860259; height 12.8 mm, width 12.6 mm.



ripheral cord smooth with shallow medial stria. Base weakly convex, with 9 broad, coarsely beaded and 2 narrow, smooth spiral cords; circumumbilical cord strongest and most strongly beaded. Umbilicus 20% maximum shell diameter, wall white with faint flush of pink. Aperture subquadrate, lips thin, weakly crenulate; columella weakly sigmoid, somewhat thickened, terminating in sharp denticle. Shell ground color predominantly orange-brown with spots and flammules of white and darker orange-brown.

**Holotype:** USNM 860259, height 12.8 mm, width 12.6 mm.

**Type locality:** Off Cabo de la Vela, Colombia, JOHN ELLIOTT PILLSBURY Station P-774, 11°56.5'N, 72°17.9'W, in 5–9 m.

**Distribution:** This species is only known from the holotype shell.

**Remarks:** The holotype of *Calliostoma fucosum* resembles a small *C. euglyptum*, but the shell is umbilicate, proportionately broader, has stronger and coarser sculpture, and has a much brighter color pattern.

The specimen of *C. fucosum* was trawled in shallow water from a bottom composed principally of calcareous red algae (UMML, unpublished).

*Calliostoma vinosum* new species  
(figures 53–56, 114)

*Calliostoma* (*Elmerlinia*) *bullisi*: Rios, 1970:24, pl. 5. (Non *Calliostoma bullisi* Clench & Turner, 1960).

*Calliostoma barbouri*: Rios, 1975:23, pl. 5, fig. 60; 1985:22, pl. 10, fig. 87. (Non *Calliostoma barbouri* Clench & Aguayo, 1946).

*Calliostoma javanicum*: Leal, 1991:45, 353 (partim). (Non *Trochus javanicum* Lamarck, 1822).

**Description:** Shell medium-sized, attaining height of 19.8 mm, width of 21.3 mm, conical, umbilicate, finely sculptured. Protoconch 325–350  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls 8, flat to weakly convex; first whorl initially with 2 strong spiral cords and low, rounded axial riblets; axial sculpture absent after first one-third whorl; spiral sculpture increasing by intercalation to 9–15 beaded cords and 0–6 smooth to finely beaded threads, of which abapical 2 cords forming periphery, beads rounded; surface of first 4–5 whorls microscopically frosted; periphery narrow, subcarinate, abapical peripheral cord often with shallow, median groove. Base flat to weakly concave, with 12–14 narrow, finely beaded spiral cords and 0–3 spiral threads. Umbilicus funnel-shaped, 18%–22% maximum shell diameter, wall smooth, white or flushed with yellow. Aperture subquadrate, lips thin, crenulate; columella weakly sigmoid, weakly thickened, terminating in sharp denticle. Shell ground color deep red-brown with crescentic streaks of yellow-brown above periphery; base golden brown with 6–9 spiral lines of red-brown. Animal (in alcohol): foot red-brown with large, white papillae; mantle with narrow band of white and

red-brown spots at edge behind which is series of dark brown spots extending posteriorly as gradually fading streaks; cephalic tentacles red-brown with darker median stripe, white near base, left tentacle stout, about length of snout, right tentacle longer and more slender; snout long, broad, mottled red-brown and white, with anterior fringe of long papillae; epipodium with 4 pairs of red-brown tentacles, neck lobes well-developed, semicircular, left lobe smooth, right lobe finely fringed.

**Holotype:** MORC 29.294, height 13.5 mm, width 15.3 mm.

**Type locality:** Off Guarapari, Estado de Espirito Santo, Brazil, in 18–22 m.

**Paratypes:** 1, USNM 860256; 1, FSBC 1 44067; both from same lot as holotype.—1, MORC 15.043; off Cabo Orange, Estado de Amapá, Brazil, ALMIRANTE SALDANHA Station 2029, 103 m; 30 November 1968.

**Other material:** 1, MNHN uncatalogued; MARION-DUFRESNE Cruise MD-55, Station DC-40, 20°40'S, 34°41'W, 60 m; 17 May 1987; dredge.—2, MNHN uncatalogued; MARION-DUFRESNE Cruise MD-55, Station DC-47, 20°42'S, 32°13'W, 94–105 m; 19 May 1987; dredge.—2, MNHN uncatalogued; MARION-DUFRESNE Cruise MD-55, Station DC-42, 20°55'S, 34°01'W, 60 m; 17 May 1987; dredge.—7, MNHN uncatalogued; MARION-DUFRESNE Cruise MD-55, Station DC-15, 21°37'S, 40°18'W, 37 m; 11 May 1987; dredge.

**Distribution:** *Calliostoma vinosum* is known in north-eastern Brazil from the Amazon River to just north of Rio de Janeiro, in 18–105 m.

**Remarks:** Shells of *Calliostoma vinosum* are most similar to those of *C. barbouri* in shape, size, and color but differ by having a somewhat smaller protoconch (325–350  $\mu$ m vs. 350–400  $\mu$ m); by having flat-sided rather than convex whorls; by having fewer, stronger, more coarsely beaded spiral cords, particularly on the base; by having axial riblets that disappear early on the first whorl rather than persisting onto the second whorl; by lacking collabral threads between the primary spiral cords; and by having the first 4–5 whorls more distinctly frosted.

Most of the specimens examined for this study were trawled from bottoms on which bryozoans and coralline algae were abundant (J. & M. Coltro, personal communication; Leal, 1991).

*Calliostoma alternum* new species  
(figures 57, 58)

**Description:** Shell medium-sized, attaining height of 15.6 mm, width of 13.9 mm, conical, umbilicate, finely sculptured. Protoconch about 350  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls about 8.5, flat; first 4 whorls with low, rounded axial riblets and 2–7 beaded spiral cords; axial sculpture reduced to fine collabral threads or absent on subsequent whorls; spiral sculpture



increasing by intercalation to 7–11 beaded cords and 5–6 threads, of which abapical 3 cords forming periphery; periphery narrowly rounded. Base weakly convex, with 17 narrow, finely beaded spiral cords. Umbilicus 22%–24% maximum shell diameter, wall almost vertical, white. Aperture subquadrate, lips thin, weakly crenulate; columella weakly sigmoid, rather thin, terminating in small, rounded denticle. Shell ground color uniformly ivory or with very faint peripheral light brown maculations.

**Holotype:** USNM 860257, height 15.6 mm, width 13.9 mm.

**Type locality:** Northeast of Caracas, Venezuela, JOHN ELLIOTT PILLSBURY Station P-737, 10°44.0'N, 66°07.0'W, in 60–73 m.

**Paratypes:** 1, UMML 30.8374; off Península de la Guajira, Colombia, JOHN ELLIOTT PILLSBURY Station P-769, 12°31.0'N, 71°41.0'W, 143–146 m; 28 July 1968; 10-ft otter trawl.—1, UMML 30.6155; off Suriname, JOHN ELLIOTT PILLSBURY Station P-684, 7°19.0'N, 56°51.0'W, 55–59 m; 14 July 1968; 10-ft otter trawl.

**Distribution:** Shells of this species are known from northeastern Colombia, Venezuela, and Suriname, in 55–146 m.

**Remarks:** Shells of *Calliostoma alternum* are most similar to those of *C. aulicum* but differ by being evenly conical rather than coeloconoid; by having a more rounded, less strongly projecting periphery; by having fewer, stronger, more coarsely beaded spiral cords, most of which are separated by a fine spiral thread; by having axial riblets that persist on the first four whorls rather than only on the first two; and by having the abapical of the two primary spiral cords remaining conspicuously strong on first five whorls.

The specimens of *C. alternum* were collected on bottoms composed of carbonate rock covered by calcareous algae and sponges (UMML, unpublished).

*Calliostoma aulicum* new species  
(figures 59–62)

**Description:** Shell medium-sized, attaining height of 15.9 mm, width of 16.1 mm, conical, umbilicate, finely sculptured. Protoconch about 350  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls 7.3, weakly concave; first two whorls with low, rounded axial riblets and 2–3 beaded spiral cords; axial sculpture absent after second whorl; spiral cords strongly beaded, increasing by intercalation to 10–12, of which abapical 3 strongest cords forming periphery on last whorl, beads rounded; periphery narrowly rounded. Base flat to weakly convex, with 17–19 narrow, finely beaded spiral cords. Umbilicus funnel-shaped, 17%–20% maximum shell diameter, wall white. Aperture subquadrate, thickened and strongly ridged within, lips thin, crenulate; columella weakly sigmoid, thickened, terminating in narrow denticle. Shell ground color ivory with few, faint patches of golden brown.

**Holotype:** USNM 860258, height 15.9 mm, width 16.1 mm.

**Type locality:** Off Colón, Panamá, JOHN ELLIOTT PILLSBURY Station P-451, 9°22.0'N, 79°56.0'W, in approximately 12 m.

**Paratype:** 1, UMML 30.8375; off Suriname, JOHN ELLIOTT PILLSBURY Station P-669, 6°39.0'N, 55°15.5'W, 33 m; 10 July 1968; 10-ft otter trawl.

**Other material:** 1 fragment, UMML 30.7238; off Orinoco River, Venezuela, JOHN ELLIOTT PILLSBURY Station P-835, 9°36.0'N, 60°10.0'W, 48 m; 30 June 1968; 10-ft otter trawl.—1 fragment, UMML 30.7306; off Galera Point, Trinidad, JOHN ELLIOTT PILLSBURY Station P-840, 10°40.5'N, 60°37.5'W, 33–37 m; 1 July 1968; 10-ft otter trawl.

**Distribution:** *Calliostoma aulicum* is known from off Panamá and eastern Venezuela in 12–48 m.

**Remarks:** Shells of this species are very similar to those of *Calliostoma tampaense* but differ by having a slightly larger protoconch (350  $\mu$ m vs. 325  $\mu$ m); by having a more broadly rounded, more strongly projecting periphery; by being much thicker; by having more strongly beaded basal spiral cords; and by lacking a distinct color pattern. If the holotype of *C. aulicum* represents the size of a fully grown adult, as the thickened and ridged aperture seems to indicate, then *C. aulicum* is much smaller than *C. tampaense*, shells of which attain a height of about 30 mm (Quinn, in press).

*Calliostoma hirtum* new species  
(figures 63, 64)

**Description:** Shell medium-sized, attaining height of 17.9 mm, width of 19.8 mm, conical, umbilicate, finely sculptured. Protoconch missing. Teleoconch whorls about 7, flat to weakly concave; first remaining whorl worn smooth; next whorl with 4 beaded spiral cords, cords increasing to 13, of which abapical 2 cords forming periphery on last whorl, beads conical; periphery carinate, adapical peripheral cord stronger than abapical peripheral cord. Base weakly concave to weakly convex, with 17–18 narrow, weakly beaded spiral cords. Umbilicus funnel-shaped, 20% maximum shell diameter, wall almost vertical, white or yellow-brown. Aperture subquadrate, lips thin, crenulate; columella weakly sigmoid, thin. Shell ground color light yellow-brown with diffuse flammules of cream and light brown; interspaces between several spiral cords golden brown.

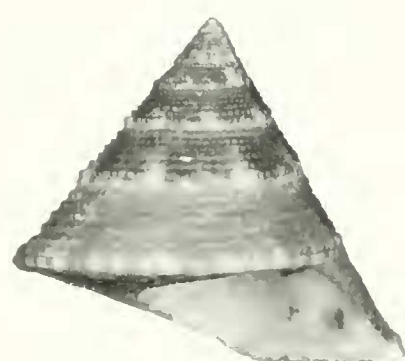
**Holotype:** USNM 860260, height 17.9 mm, width 19.8 mm.

**Type locality:** Off Navidad Bank, northeast of the Dominican Republic, JOHN ELLIOTT PILLSBURY Station P-1160, 20°01'N, 68°51'W, in 521 m.

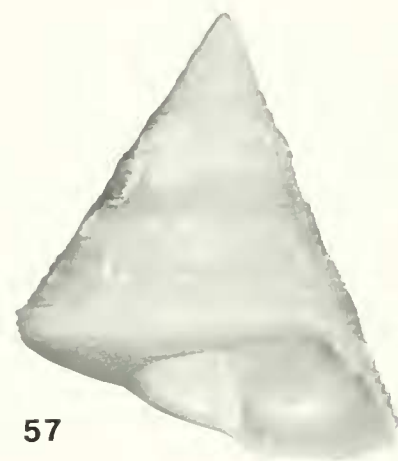
**Paratype:** 1, UMML 30.8371; from same lot as holotype.



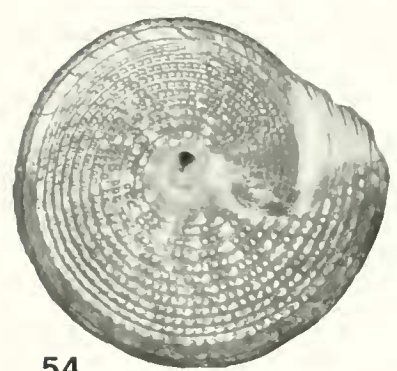
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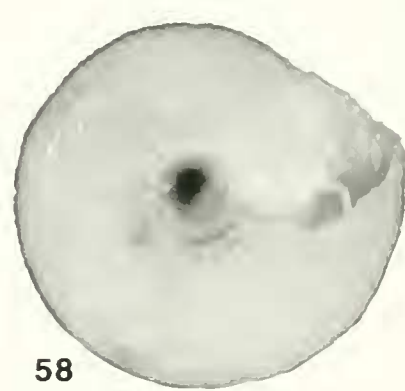
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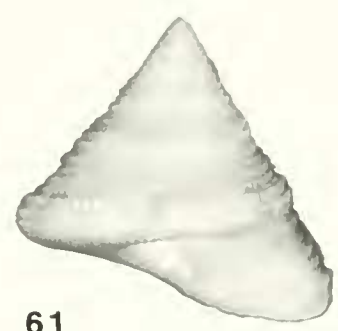
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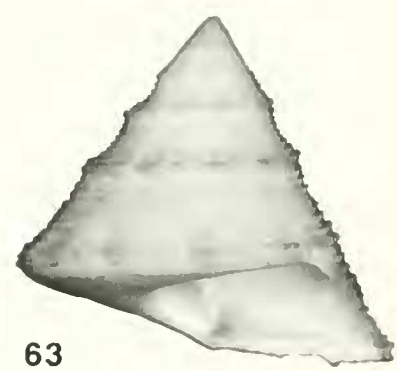
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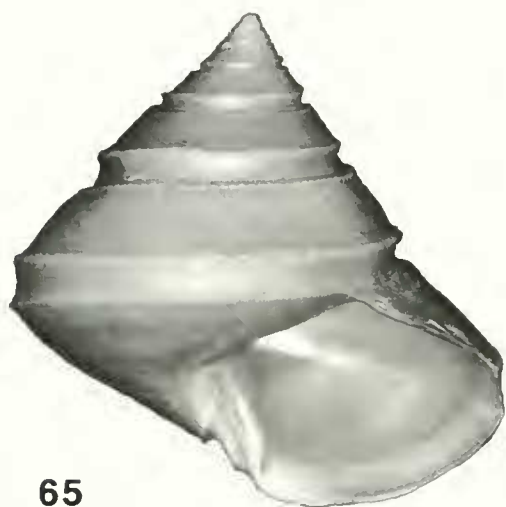
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Figures 65, 66. *Calliostoma atlantis* Clench & Aguayo, 1940, holotype, MCZ 135164; height 32.7 mm, width 33.6 mm.

**Distribution:** This species is known only from the type locality.

**Remarks:** The shells of *Calliostoma hirtum* are most similar to those of *C. javanicum* but differ by having a stronger, more sharply beaded peripheral cord; by lacking axial sculpture in the interspaces between the spiral cords; and by having more numerous, sharper spiral cords, particularly on the outer part of the base.

*Calliostoma atlantis* Clench & Aguayo, 1940 (figures 65, 66)

*Calliostoma* (*Calliostoma*) *atlantis* Clench & Aguayo, 1940: 81, pl. 13, fig. 4

*Calliostoma atlantis*: Clench & Turner, 1960:62, pl. 44; Harasewych, 1989:27, pl. 17.

*Calliostoma* (*Kombologion*) *atlantis*: Abbott, 1974:45.

**Description:** See Clench and Aguayo (1940:81) and Clench and Turner (1960:62).

**Holotype:** MCZ 135164, height 32.7 mm, width 33.6 mm.

**Type locality:** Northwest of Mariel, Cuba, ATLANTIS Station 3306, 23°04'30"N, 82°37'00"W, in 604 m.

**Other material:** 1, USNM 869000; off Great Inagua Island, Bahama Islands, JOHNSON-SEA-LINK I Station JSL-I-2323, 21°01'45"N, 74°43'48"W, 628 m; 15 October 1988.

**Distribution:** The specimen of this species reported here is only the second collected and extends the range from

northwestern Cuba to off Great Inagua Island northeast of the eastern tip of Cuba. This specimen was collected by M. G. Harasewych, using the submersible JOHNSON-SEA-LINK I from a large boulder in 628 m, a depth very similar to that from which the holotype was collected (604 m). The animal was reported to be bright red (Harasewych, 1989:27).

**Remarks:** Based on shell characters, *Calliostoma atlantis*, *C. torrei*, *C. dnopherum*, and the new species *C. rugosum*, *C. atlantoides*, *C. rota*, and *C. coronatum* form a distinctive species group. All seven species have shells with strongly bicarinate whorls, at least on the first several whorls; have, at the beginning of the first teleoconch whorl, an adapical spiral cord that becomes weak or disappears on subsequent whorls; have a weak angulation or strong spiral cord below the peripheral cord; have the inner lip of the columella weakly or strongly reflected over the umbilicus, or thickened and filling the umbilicus with callus; and have the columella rounding into the outer lip. Other species that may belong to this group include *C. cubanum* Clench & Aguayo, 1940, and the eastern Atlantic *C. grimaldii* Dautzenberg & Fischer, 1896; *C. leptophyma* Dautzenberg, 1927; *C. normani* Dautzenberg, 1927; and *C. caroli* Dautzenberg, 1927.

*Calliostoma dnopherum* (Watson, 1879),  
new combination  
(figures 67–69)

*Trochus* (*Margarita*) *dnopherus* Watson, 1879:711; 1886:90, pl. 5, fig. 3.

Figures 53–56. *Calliostoma vinosum* new species. 53, 54. Holotype, MORG 29.294; height 13.5 mm, width 15.3 mm. 55, 56. Paratype, MORG 15.043; height 10.2 mm, width 11.9 mm. Figures 57, 58. *Calliostoma alternum* new species, holotype, USNM 860257; height 15.6 mm, width 13.9 mm. Figures 59–62. *Calliostoma aulicum* new species. 55, 56. Holotype, USNM 860258; height 15.9 mm, width 16.1 mm. 57, 58. Paratype from JOHN ELLIOTT PILLSBURY Station P-669, UMML 30.8375; height 10.8 mm, width 11.2 mm. Figures 63, 64. *Calliostoma hirtum* new species, holotype, USNM 860260; height 17.9 mm, width 19.8 mm.





Figures 67–69. *Calliostoma dnopherum* (Watson, 1879). Lectotype of *Trochus* (*Margarita*) *dnopherus*, BM(NH) 1887.2.9.333; height 7.2 mm, width 8.8 mm.

*Margarites dnopherus*: Lange de Morretes, 1949:55.  
*"Margarites" dnopherus*: Rios, 1955:19, pl. 8, fig. 72.

**Description:** See Watson (1879:711; 1886:90).

**Lectotype (here selected):** BM(NH) 1887.2.9.333, height 7.2 mm, width 8.8 mm.

**Type locality:** Southeast of Recife, Brazil, CHALLENGER Station 122, 9°05'S, 34°49'W, in 640 m.

**Paralectotypes:** 4 (broken or fragments), BM(NH) 1887.2.9.334–335; from same lot as holotype.

**Other material:** 1, Coltro collection; off Ilha de São Sebastião, Estado de São Paulo, Brazil, 600 m; dredge; 1991.

**Distribution:** This species is now known from off Recife to off São Paulo, Brazil (a range extension of approximately 2000 km), in 600–640 m.

**Remarks:** The shape and sculpture of the shells of this species are very similar to those of *C. rota*, *C. atlantoides*, and *C. coronatum* (q. v.); therefore, the species is here transferred to *Calliostoma sensu lato*. Shells of *C. dnopherum* differ from those of *C. rota* by being somewhat higher and more globose, by having a larger protoconch (825–850  $\mu\text{m}$  vs. 400–425  $\mu\text{m}$ ), by having a strong spiral cord midway between the shoulder spiral cord and the circumbasal cord, by having a strong spiral cord just beneath the circumbasal cord, and by having an open umbilicus. Differences between *C. dnopherum* and *C. atlantoides* and *C. coronatum* are discussed in the Remarks in the species accounts of the latter two species.

The syntype lot originally contained five specimens, one large, live-collected specimen and four very small shells. The large shell is in excellent condition, although the animal was removed at some point and the operculum glued to cotton in the aperture. Of the four small shells, one has completely disintegrated, and the other three are in various stages of disintegration.

The recently collected specimen (Coltro collection) is very similar to the lectotype but is slightly smaller (7.0 mm height, 8.5 mm width), lacks fine threads between the supraperipheral spiral cords, has one fewer basal

spiral cord, and has the inner lip of the columella rather strongly expanded to almost cover the umbilicus.

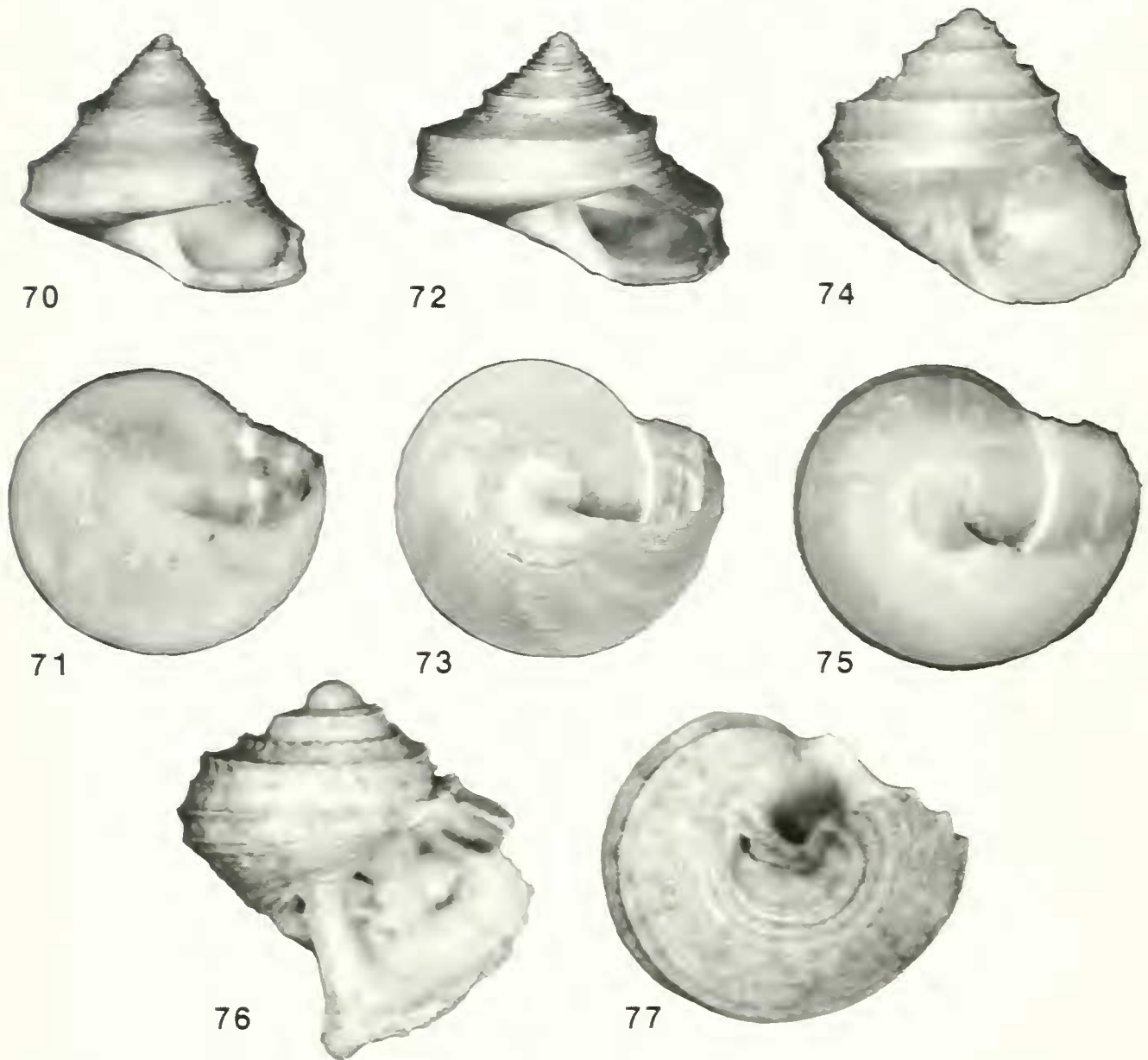
*Calliostoma rota* new species  
 (figures 70–73, 117, 118)

**Description:** Shell small, attaining height of 8.1 mm, width of 9.9 mm, depressed turbate, nonumbilicate. Protoconch 400–425  $\mu\text{m}$  maximum diameter, 1 whorl. Teleoconch whorls 5.5, rapidly expanding, carinate; first whorl initially with 2 smooth spiral cords; adapical cord strong on first 2 whorls, gradually weakening to fine thread on next 3 whorls, finely undulate to beaded on last 3 whorls; abapical cord strong, smooth to weakly undulate on all whorls, forming carinate whorl shoulder; subsutural cord appearing on first quarter-whorl, becoming strong, finely beaded by third whorl; last whorl with strong, smooth, circumbasal spiral cord forming peripheral carina; interspaces between spiral cords concave with fine, smooth or finely beaded spiral threads (last whorl with 11–12 between subsutural and shoulder cords, 8–14 between shoulder and peripheral cords); axial sculpture absent except fine growth lines. Base almost flat, with 17–21 weak to strong, flat, smooth spiral cords and 0–4 fine threads in interspace between peripheral cord and outermost basal cord; outermost cord sometimes forming very weak subperipheral angulation. Umbilicus filled with callus. Aperture subquadrate; outer lip thin, angulate; inner lip thickened, forming umbilical plug; columella rather short, concave in upper third, straight below. Shell ground color ivory to pinkish tan with green and pink iridescence, with regularly spaced spots of light to dark yellow-brown on subsutural, shoulder, peripheral, and 1–2 inner basal cords, basal cords sometimes lacking spots.

**Holotype:** MORC 29.295, height 8.1 mm, width 9.3 mm.

**Type locality:** Off Ilhabela, Ilha de São Sebastião, Estado de São Paulo, Brazil, in 20–30 m.

**Paratype:** 1, MICZ 258057; off Rio de Janeiro, Estado de Rio de Janeiro, Brazil, from stomach of starfish, in about 46 m; Bernard Tursch collector.



Figures 70–73. *Calliostoma rota* new species. 70, 71. Holotype, MORG 29 295, height 8.1 mm, width 9.3 mm. 72, 73. Paratype, MCZ 258057, height 7.6 mm, width 9.9 mm. Figures 74, 75. *Calliostoma atlantoides* new species, holotype, USNM 860261, height 9.1 mm, width 10.0 mm. Figures 76, 77. *Calliostoma coronatum* new species, holotype, MCZ 274568, height 4.2 mm, width 4.2 mm.

**Other material:** 1. Coltro collection: from same lot as holotype.

**Distribution:** This species is known only from off Rio de Janeiro and São Paulo, Brazil, in 20–46 m; the single living specimen was from 46 m.

**Remarks:** Shells of *Calliostoma rota* are most similar to those of *C. dnopherum* but differ by having more whorls, by having a much smaller protoconch, by lacking a strong spiral cord between the shoulder and circum-

basal cords, by lacking a strong subperipheral spiral angulation, and by having the umbilicus filled with callus. The radula of *C. rota* formula 12–13.7 1 7.12–13; figures 117, 118 has two principal characters that depart from the typical calliostomatine morphology: 1) the reduced number of elements in the marginal tooth field, and 2) the single, uncusped tooth base representing the outer lateral tooth. The number of pairs of calliostomatine marginal teeth is rarely reported, but in those instances where the number of pairs is known (e.g., Calvo, 1987),

the number is 25 or more except in *Astele* Swainson, 1855, the type species of which has about 20 pairs (Clench & Turner, 1960:76); however, in *C. rota* there are only 12 or 13 pairs. The presence of a single, uncusped outer lateral tooth has not been reported previously in the Calliostominae, although this condition bridges the gap between the majority of species that have all lateral teeth cusped and those in the *C. jujubinum* species group that have the outer two pairs of lateral teeth uncusped. However, although the anterior two-thirds of the radula examined here had the uncusped lateral tooth, a few teeth from the posterior third retained a membranaceous, rudimentary cusp. The holotype and Coltro specimen were dredged from muddy sand bottom.

*Calliostoma atlantoides* new species  
(figures 74, 75, 115, 116)

**Description:** Shell small, attaining height of 9.1 mm, width of 10.0 mm, turbinate, narrowly umbilicate. Protoconch 1.10 mm maximum diameter, 1 whorl. Teleoconch whorls 3.4, rapidly expanding, carinate; first whorl initially with 2 smooth, spiral cords, adapical cord disappearing by end of first whorl, abapical cord strengthening and forming strong midwhorl carination on subsequent whorls; third spiral cord appearing between adapical cord and suture near beginning of first whorl, strengthening and forming rather strong subsutural angulation; both subsutural and midwhorl angulations set with narrow, rounded, spirally elongate beads; last whorl with strong, smooth spiral cord forming periphery; interspaces between spiral angulations weakly concave, with fine, smooth spiral threads (last whorl with 2 between suture and subsutural angulation, 16 between subsutural and midwhorl angulations, and 12 between midwhorl and peripheral angulations); axial sculpture of low, rounded riblets restricted to first 1.25 whorls. Base divided into narrow, weakly concave peripheral zone and broad, weakly convex central zone by strong spiral cord; peripheral zone with 6 spiral threads, central zone with about 18 weak, smooth spiral cords. Umbilicus funnel-shaped, broad, about 25% maximum shell diameter, wall strongly constricted to narrow pore. Aperture obscurely subquadrate, almost elliptical; outer lip thin, slightly angulate; inner lip thin and expanded above to partially cover umbilicus, becoming narrower and thicker below; columella concave in upper and lower quarters, almost straight in middle half, narrow above but broad and weakly concave at base, with prominent adapical nacreous tongue. Shell ground color silvery white with brilliant pink and green iridescence.

**Holotype:** USNM 860261, height 9.1 mm, width 10.0 mm.

**Type locality:** West of St. Lucia, Lesser Antilles, JOHN ELLIOTT PILLSBURY Station P-904, 13°45.5'N, 61°05.7'W, in 417–589 m.

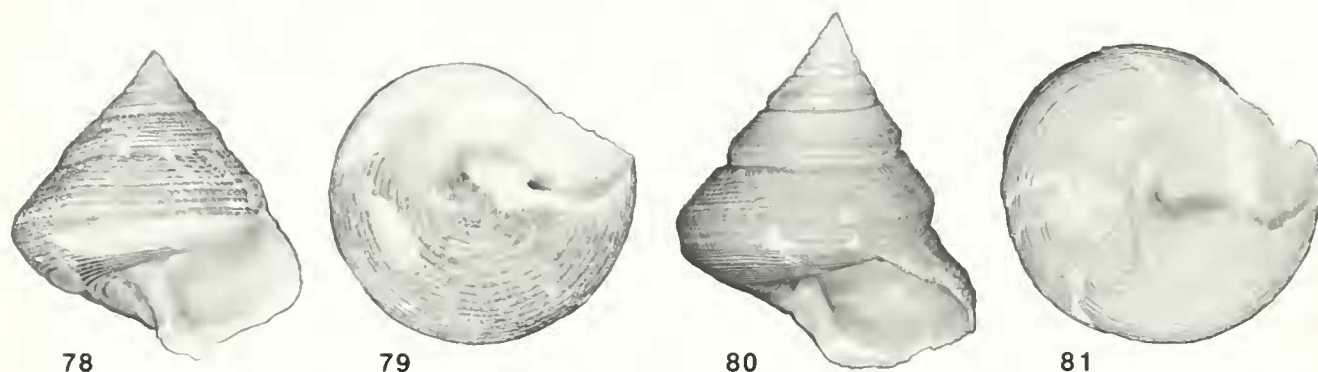
**Distribution:** This species is known only from the type locality.

**Remarks:** In shell shape and sculpture, *Calliostoma atlantoides* is most similar to *C. coronatum* new species but differs by having a larger protoconch, by having the beads on the subsutural spiral cord weaker and more widely spaced, by having numerous spiral threads in the interspaces, by having a strongly beaded rather than finely undulate shoulder spiral cord, by having weaker and more numerous basal spiral cords, and by having the inner columellar lip expanded to partially cover the umbilicus. The shell of *C. atlantoides* is also very similar to those of *C. rota* and *C. dnopherum*. It differs from that of *C. rota* by being relatively higher and more globose, by having a much larger protoconch, by having a more coarsely beaded subsutural spiral cord, by having a strongly beaded rather than smooth shoulder spiral cord, by having an open umbilicus, and by being silvery white rather than slightly brassy. The shell of *C. atlantoides* differs from those of *C. dnopherum* by being relatively higher; by having a larger protoconch; by having a single, beaded spiral cord rather than two smooth spiral cords below the subsutural cord; by having finer, more numerous spiral threads in the interspaces; by having more numerous basal spiral cords; and by having the inner lip of the columella thinner and more strongly expanded to partially cover the umbilicus. *Calliostoma atlantoides* is similar to *C. atlantis* but has a much smaller, more globose shell; has a much larger protoconch; has the shoulder spiral cord located much higher on the whorl; has a much stronger subperipheral angulation; and has the inner lip of the columella thin and partially covering the umbilicus rather than being thickened and completely filling the umbilicus. The radula of *C. atlantoides* (formula <20.5?1.5?<20; Figures 115, 116) is very small (length 3.1 mm) and delicate, and there seem to be five, thin-cusped laterals and fewer than 20 pairs of marginal teeth, the innermost of which has a heavily buttressed and rather finely denticulate cusp. The seemingly degenerate radula of *C. atlantoides* is similar to that illustrated for an undescribed species of *Calliostoma* illustrated by Hickman and McLean (1990:fig. 71C).

*Calliostoma coronatum* new species  
(figures 76, 77)

**Description:** Shell small, attaining height of 4.2 mm, width of more than 4.2 mm, depressed turbinate, umbilicate. Protoconch 850  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls about 2.2, rapidly expanding, carinate; first whorl initially with 3 smooth spiral cords, adapical cord disappearing at whorl 1.3, midwhorl cord strengthening, becoming weakly undulate at whorl 1.3 and forming strong midwhorl angulation, abapical cord remaining weak on all whorls; fourth spiral cord appearing between adapical cord and suture at whorl 0.3, rapidly strengthening, undulate on last half of first whorl, undulations becoming strong, closely set, upturned, triangular beads; last whorl with strong, smooth spiral cord forming periphery; interspaces smooth except for weak spiral cord between midwhorl and peripheral cords; axial





**Figures 78, 79.** *Calliostoma rugosum* new species, holotype, USNM 860262, height 23.5 mm, width 24.8 mm. **Figures 80, 81.** *Calliostoma torrei* Clench & Aguayo, 1940, holotype, MCZ 135165; height 40.8 mm, width 36.8 mm.

sculpture absent except for low, rather broad, rounded folds on last whorl. Base divided into narrow, smooth, concave peripheral zone and broad, almost flat central zone by strong, smooth spiral cord; central zone with 12 narrow, smooth spiral cords, adaxial 3 somewhat stronger and more widely spaced. Umbilicus rather narrow, less than 20% maximum shell diameter, constricted within to small pore. Aperture probably obscurely subquadrate or ovate, outer lip broken; inner lip thin, narrow, slightly reflected over umbilicus; columella convex, thin.

**Holotype:** MCZ 27456S, height 4.2 mm, width 4.2+ mm.

**Type locality:** Off João Pessoa, Brazil, CHAIN Cruise 35, Station 12, 7°09.0'S, 34°25.5'W, in 768–805 m.

**Distribution:** This species is known only from the type locality.

**Remarks:** *Calliostoma coronatum* is similar to *C. dno-pherum* but differs by having a relatively smaller, lower-spired shell that has a much weaker spiral cord between the shoulder and peripheral cords, that lacks spiral threads between the primary spiral cords, and that has a proportionately narrower umbilicus.

*Calliostoma rugosum* new species  
(figures 78, 79)

**Description:** Shell medium-sized to large, attaining estimated height of 25 mm, estimated width of 31 mm, trochoid, nonumbilicate. Protoconch worn, at least 550  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls about 7.5 (last 0.5 whorl broken), flat to weakly concave; first 2 whorls worn and partially decorticated; whorls 3–4 with 5 strong, subequal, beaded spiral cords, adapical cord forming weak subsutural angulation, abapical cord forming upper limit of flat periphery bearing 1 spiral thread; subsutural and upper peripheral cords each splitting into 2 subequal spiral cords on whorls 5–6; spiral cords between subsutural and upper peripheral cords increasing to 7 by end of seventh whorl; peripheral zone with 4 spiral cords by end of seventh whorl, periphery

becoming rounded on last whorl; all cords set with rather strong, rounded, generally spirally elongate beads. Base weakly convex, with 19 strong, smooth, subequal spiral cords. Umbilical area filled with irregularly ridged callus. Aperture subquadrate; outer lip broken; inner lip thickened; columella concave, broken basally.

**Holotype:** USNM 860262, height 23.5+ mm, width 24.8+ mm.

**Type locality:** Straits of Florida, JAMES M. GILLIS Cruise 7307, Station 13, depth and exact locality unknown.

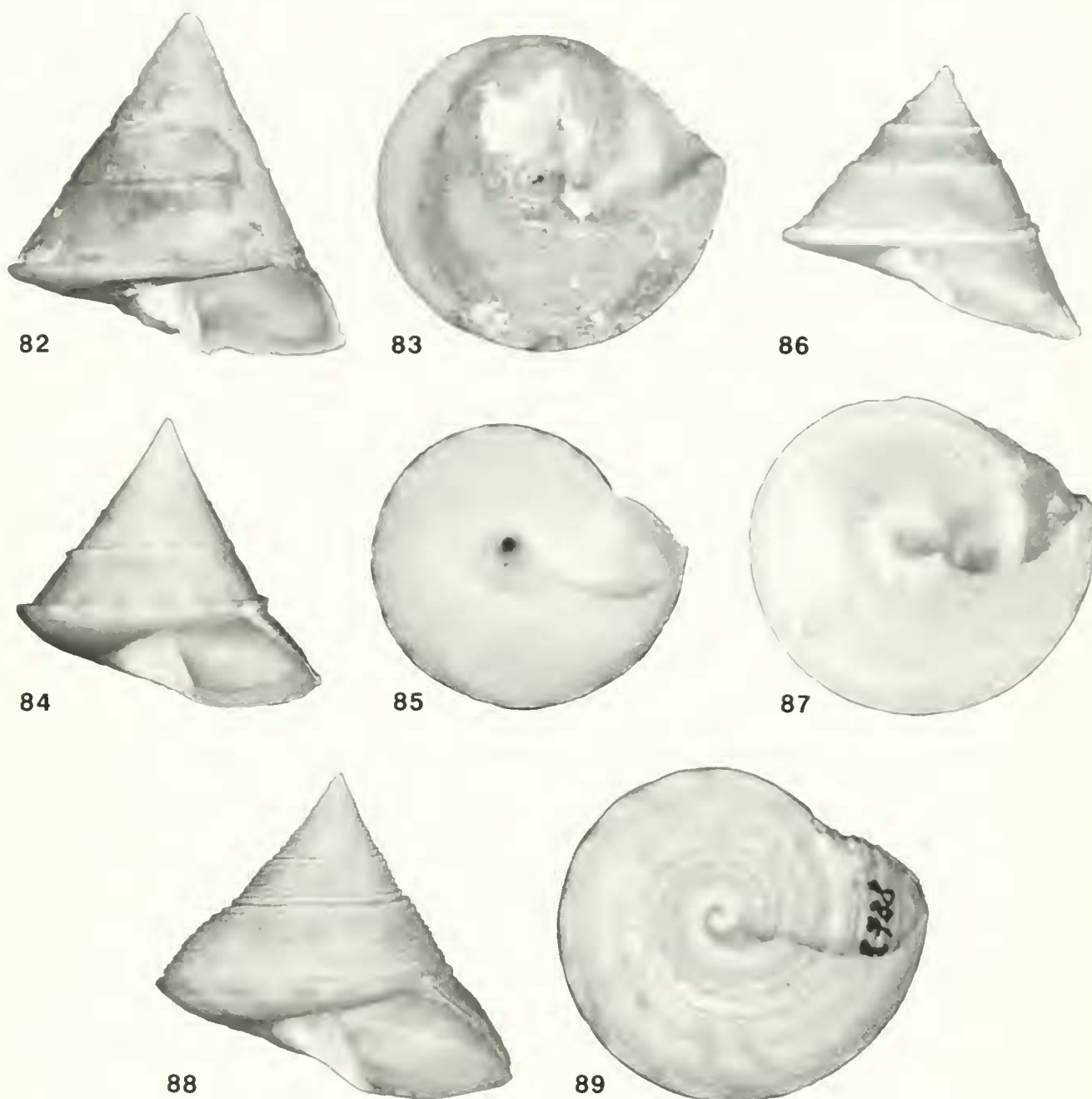
**Distribution:** This species is known only from the type locality.

**Remarks:** The holotype of *Calliostoma rugosum* is very similar to that of *C. torrei* Clench and Aguayo, 1940 (figures 80, 81), from off Cárdenas, Cuba, but differs by being relatively much broader; by having a weaker, more abapical upper peripheral cord; by having coarser, more rounded spiral cords; and by having larger, rounded, spirally elongate beads on the cords. The protoconch of *C. rugosum* (estimated to be more than 550  $\mu$ m) may be larger than that of *C. torrei* (about 525  $\mu$ m), and the subsutural and upper peripheral cords of *C. rugosum* split into two rather coarse cords rather than three fine, sharp cords as in *C. torrei*. Both *C. rugosum* and *C. torrei*, based on similarities of shape and sculpture, seem to be closely related to *C. caribbeanum* Weisbord, 1962, a fossil species from the Pleistocene Mare Formation of Venezuela.

*Calliostoma argentum* new species  
(figures 82–85)

*Calliostoma marionae*: Sander & Lalli, 1982:table 4. (Non *Calliostoma marionae* Dall, 1906).

**Description:** Shell medium-sized, attaining height of 25.6 mm, width of 28.2 mm, conical, umbilicate, finely sculptured to almost smooth. Protoconch about 375  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls about 9.5, flat to very weakly convex; first 2 whorls with low, rounded axial riblets and 2–3 finely beaded spiral cords;



Figures 82–85. *Calliostoma argentum* new species. 82, 83. Holotype, USNM 860263; height and width 18.1 mm. 84, 85. Specimen from off Barbados, Sunderland collection; height 22.5 mm, width 24.2 mm. Figures 86, 87. *Calliostoma jeanneae* Clench & Turner, 1960, holotype, MCZ 228370; height 11.2 mm, width 13.2 mm. Figures 88, 89. *Calliostoma axelolssoni*, new name, specimen from off Mostardas, Brazil, MORC 18 738; height 30.4 mm, width 34.2 mm.

axial sculpture absent on subsequent whorls; spiral cords increasing by intercalation to 9–11, beading disappearing on fourth or fifth whorl but sometimes reappearing on eighth or ninth whorl; periphery sharply carinate, smooth, sometimes reflected adapically. Base flat to weakly convex, with 13–15 weak, broad, smooth spiral cords, adaxial 2–3 cords slightly stronger, weakly beaded; circumumbilical cord strong, coarsely beaded. Umbilicus funnel-

shaped, 14%–17% maximum shell diameter, wall almost vertical, white. Aperture subquadrate, slightly thickened within and with several low, rounded ridges, lips thin; columella rather long, weakly concave, slightly thickened, terminating in small, rounded tubercle. Shell ground color cream to light tan with pale orange-brown patches below suture and spots on periphery; base uniformly cream.

**Holotype:** USNM 860263, height and width 18.1 mm.

**Type locality:** Arrowsmith Bank, Quintana Roo, Mexico, JOHN ELLIOTT PILLSBURY Station P-594, 21°00.5'N, 86°23.0'W, in 307–329 m.

**Paratypes:** 1, UMML 30.5583; off Arrowsmith Bank, Mexico, JOHN ELLIOTT PILLSBURY Station P-584, 21°02.0'N, 86°24.0'W, 353–347 m; 23 May 1967; 10-ft otter trawl.—1, ANSP 353529; off Holetown, Barbados; F. Sander, collector.

**Other material:** 1 fragment, UMML 30.8372; off St. Vincent, JOHN ELLIOTT PILLSBURY Station P-877, 13°16.7'N, 61°05.6'W, 348–466 m; 6 July 1969; 5-ft Blake trawl.—3, Sunderland collection; off St. James, Barbados, 175 m; dredge; F. Sander, collector.

**Distribution:** Shells of *Calliostoma argentum* are known from off the Yucatán Peninsula, Mexico, and St. Vincent and Barbados, Lesser Antilles, in depths of 175–466 m.

**Remarks:** Shells of *Calliostoma argentum* are most similar to the holotype of *C. jeanneae* (figures 86, 87), from off Havana, Cuba, but differ by being relatively narrower; by having spiral cords that are strongly beaded until the middle of the fourth or fifth whorls rather than becoming smooth near the beginning of the third whorl; by lacking a strong spiral cord just above the periphery on the third through sixth whorls; by having an umbilicus that is open rather than filled with callus; by having a strongly beaded rather than smooth circumumbilical cord; and by having a longer, less thickened and oblique columella. Perhaps of less importance are differences in the color patterns: that of *C. argentum* consists of cream to light tan spiral cords separated by darker-colored striae and pale orange-brown patches below the sutures and somewhat darker spots on the periphery; that of *C. jeanneae* consists of rows of golden-brown spots on the spiral cords above and below the periphery and brighter spots of the same color on the periphery. Both *C. argentum* and *C. jeanneae* are similar to the eastern Pacific *C. platinum*, *C. chilena*, and *C. titanium*, and all five species may be closely related to *C. metalium* Woodring, 1957, from the late Miocene to early Pliocene Chagres Sandstone of Panamá.

*Calliostoma axelolssoni* new name  
(figures 88, 89, 119)

*Calliostoma olssoni* Bayer, 1971:118, fig. 4 (left).—Kaicher, 1980:card no. 2239. (Non *Calliostoma olssoni* Maury, 1925).

*Calliostoma* (*Kombologion*) *rosewateri*: Rios, 1975:23, pl. 5, fig. 59.—Calvo, 1987:63, 65, fig. 28. (Non *Calliostoma rosewateri* Clench & Turner, 1960).

*Calliostoma* (*Kombologion*) *bairdi rosewateri*: Rios, 1985:22, pl.9, fig. 85.

**Description:** See Bayer (1971:118) for description of shell. Animal (in alcohol) white; mantle edge smooth; cephalic tentacles moderately long, slender, gradually tapering, right longer than left, ocular peduncles rather

long (about 35% tentacle length), broad, with large, black eye at tips; snout long, broad, slightly expanded at tip, tip fringed with small, short papillae; epipodium with 4 pairs of tentacles decreasing in size posteriorly, neck lobes well-developed, semicircular, smooth.

**Holotype:** USNM 700002, height 16.8 mm, width 21.0 mm.

**Type locality:** Southwest of St. Vincent, Lesser Antilles, JOHN ELLIOTT PILLSBURY Station P-876, 13°13.9'N, 61°04.7'W, in 231–238 m.

**Other material:** 1, UMML 30.8373; off Dominica, JOHN ELLIOTT PILLSBURY Station P-931, 15°31.2'N, 61°12.3'W, 174–357 m; 15 July 1969; 5-ft Blake trawl.—1, MORG 18.738; W. Besnard station, off Mostardas, Rio Grande do Sul, Brazil, 230 m; 1972.

**Distribution:** This species is now known from off Dominica and St. Vincent in the Lesser Antilles, and off southern Brazil, in 174–357 m.

**Remarks:** *Calliostoma olssoni* Bayer, 1971, is preoccupied by *C. olssoni* Maury, 1925, a species (probably assignable to *Calliomphalus* Cossmann, 1888) from the Mio-Pliocene formations of Trinidad (Maury, 1925; Jung, 1969). With F. M. Bayer's permission, I offer a replacement name that preserves his original intent to honor the late Dr. Axel A. Olsson.

The Brazilian specimen (misidentified as *C. rosewateri* by Rios, 1975, 1985) (figures 88, 89) is much larger (height 30.4 mm, width 34.2 mm) than the holotype, has a narrower umbilicus that has been partially filled with callus, has three weak circumumbilical and six weak subperipheral spiral cords, and has a more diffuse and subdued color pattern except for the pink spots on the periphery. The Dominican specimen is very similar to the holotype but is slightly larger (height 19.9 mm, width 24.1 mm), has a slightly narrower umbilicus, and has a much less vivid color pattern. The radula from this specimen (figure 119) conforms well with Calvo's illustration (1987:fig. 28) but the lateral tooth cusps are longer than he depicted.

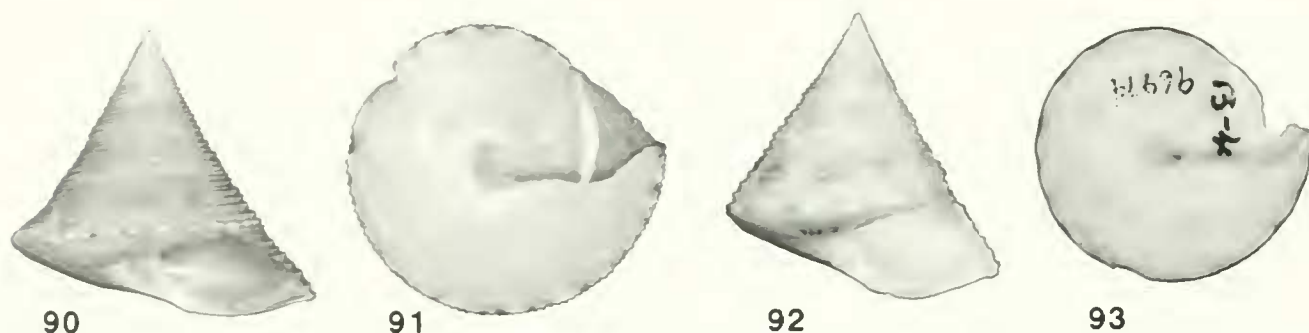
Based on shell characters, *C. axelolssoni* seems to be closely related to *C. bigelowi*, *C. brunneum*, and *C. hendersoni*—the four species forming a rather distinct subgroup of *Calliostoma*. This subgroup may be most closely related to the *C. bairdii* species group.

*Calliostoma aurora* Dall, 1888  
(figures 90, 91, 120)

*Calliostoma aurora* Dall, 1888:68, fig. 285; 1889a:366, pl. 37, fig. 2.—Clench & Turner, 1960:64, pl. 45, figs. 1, 2.

**Description:** Shell: see Dall (1889a:366) and Clench and Turner (1960:64). Animal (reconstituted in trisodium phosphate): foot mottled with red-brown, mantle edge with light, transverse band and long, median longitudinal streak of red-brown; cephalic tentacles very long, slender; eyestalks very short (less than 10% tentacle length)





Figures 90, 91. *Calliostoma aurora* Dall, 1855, specimen from off Guadeloupe, USNM 860504; height 25.4 mm, width 27.8 mm. Figures 92, 93. *Calliostoma guesti* new species, holotype, DMNH 96994; height and width 27.5 mm.

with large, black eye at tips; snout slightly longer than broad, tip fringed by rather long, stout papillae; epipodium with 3 or 4 pairs of very long, slender tentacles; neck lobes very well-developed, seemingly smooth-edged.

**Holotype:** MCZ 73505, height 21.0 mm, width 26.5 mm.

**Type locality:** Off Grenada, Lesser Antilles, BLAKE Station 265, 12°03'55"N, 61°49'40"W, in 1054 m.

**Other material:** 1, USNM 860504; off Great Inagua Island, Bahama Islands, JOHNSON-SEA-LINK I Station JSL-I-2323, 21°01'45"N, 74°43'48"W, 625 m; 15 October 1955.—1, Dan collection; off Barbados, Lesser Antilles, 153 m.

**Distribution:** *Calliostoma aurora* is now known from the southeastern Bahama Islands and from off Barbados, in depths of 153–1054 m.

**Remarks:** The present specimens agree well with the holotype in most shell characters, but are larger (Great Inagua: height 25.4 mm, width 27.8 mm; Barbados: height 23.5 mm, width 27.2 mm); have whorls with flatter profiles; and have numerous very fine spiral striae on the outer two-thirds of the base, the striae becoming deeper on the adaxial third and forming several indistinct and three distinct spiral cords near the center. The ground color of the new shells is a dark golden brown with alternating spots of white and brown on the periphery; the base of the Barbados specimen has faint, crescent-shaped streaks of pale brown; and the umbilical callus of both specimens is white.

Although Clench and Turner (1960) compared the shell morphology of *C. aurora* to that of *C. bairdii* and *C. psyche*, the relationship of this species to other *Calliostoma* species is unclear. The radula of *C. aurora* (formula  $\infty.10.1.10.\infty$ ; figure 120) indicates that the species is not very closely related to the *C. bairdii* species group or to any other western Atlantic species group. The most notable difference is that *C. aurora* has ten pairs of lateral teeth, whereas most other species have only four to seven pairs; only *Calliostoma militare* (22 pairs; Castellanos & Fernandez, 1976; Calvo, 1987) and *Venustatrochus georgianus* (16 pairs; Powell, 1951) have more lateral tooth pairs. The inner marginal teeth of *C. aurora* are also rather unusual: the innermost marginal

is rather slender with a sharply curved cusp and ten denticles, of which the terminal one is unusually long, and the next several teeth have a very long terminal denticle with four to six secondary denticles about a third of the way down the shaft.

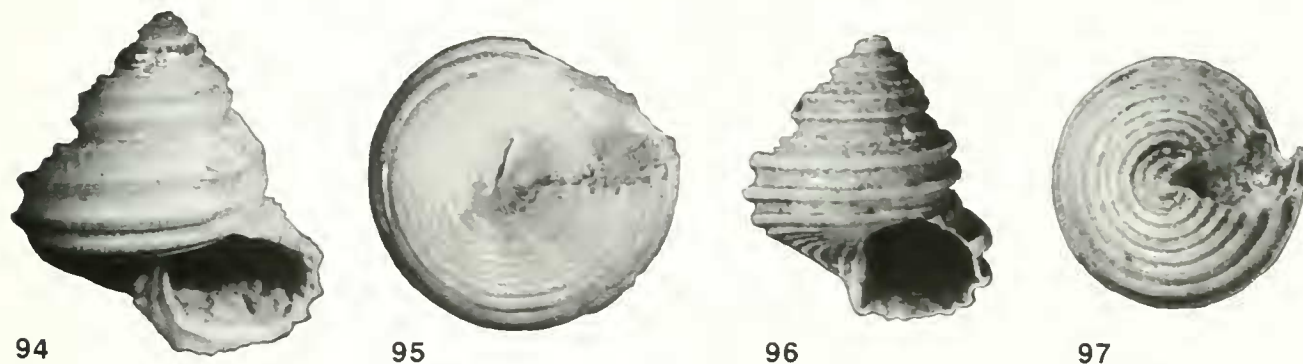
The Barbados specimen was collected alive from a depth of 153 m, which is shallower than, but comparable to, the provenance of the paratype lot (from Barbados in 256 m), suggesting that the occurrence of the holotype in 1054 m was adventitious. The specimen from Great Inagua was collected from atop a small, blue sponge (M. G. Harasewych, personal communication), and its intestine was packed with a dark brown, rather solid mass of organic material in which were embedded numerous sponge spicules and polychaete setae, suggesting that this species feeds on sponges.

*Calliostoma guesti* new species  
(figures 92, 93)

**Description:** Shell medium-sized, attaining height and width of 27.5 mm, conical, nonumbilicate, finely sculptured. Protoconch about 425  $\mu$ m maximum diameter, 1 whorl. Teleoconch whorls more than 9.1, flat to weakly convex; first 2 whorls with low, rounded axial riblets and 2–3 beaded spiral cords; axial sculpture absent on subsequent whorls; spiral cords increasing by intercalation to 12, finely beaded throughout; periphery sharp, narrowly bicarinate, peripheral cords adpressed, adapical peripheral cord distinctly stronger than abapical peripheral cord. Base weakly convex, with numerous fine striae on outer three-fourths and 3–4 weak, weakly beaded spiral cords near center. Umbilicus filled with white callosus. Aperture subquadrate, lips thin, weakly crenulate; columella rather short, weakly concave, thickened. Shell ground color ivory with irregular, diffuse patches of golden brown above periphery, somewhat more discrete spots of same color on periphery; base with very faint, crescent-shaped, radial streaks of light brown and sometimes a few spots on 1–2 spiral cords.

**Holotype:** DMNH 96994, height and width 27.5 mm.

**Type locality:** 2.5 mi off south shore of Bermuda, in 183–219 m.



**Figures 94–97.** *Calliostoma strophorum* (Watson, 1879) **94, 95.** Holotype of *Trochus (Zizyphinus) strophorus* Watson, 1879, BM(NH) 1887.2.9.210, height 7.5 mm, width 6.6 mm. **96, 97.** Holotype of *Calliostoma arestum* Dall, 1927, USNM 108412, height 5.4 mm, width 5.0 mm.

**Paratypes:** 3, DMNH 187588; 1, USNM 860270; from same lot as holotype.

**Distribution:** This species is known only from the type locality.

**Remarks:** Shells of *Calliostoma guesti* are most similar to those of *C. psyche* but differ by being relatively narrower; by having more finely beaded spiral cords; by having the suprapерipheral spiral cord on all whorls sharply beaded and stronger than the subsutural cord rather than being smooth on the first two to three whorls and weaker than the subsutural cord; by having the periphery composed of two adpressed spiral cords, of which the adapical cord is distinctly stronger, rather than having the cords subequal and separated by a concave interspace that is as wide or wider than the cords; by having much weaker spiral and radial sculpture on the base; and by having a color pattern of light brown rather than rose, particularly on the periphery.

*Calliostoma guesti* is named in honor of Mr. Arthur Guest for his contributions to the knowledge of the molluscan fauna of Bermuda.

*Calliostoma strophorum* (Watson, 1879)  
new combination  
(figures 94–97)

*Trochus (Zizyphinus) strophorus* Watson, 1879:695, 1886:59, pl. 6, fig. 2.

*Calliostoma arestum* Dall, 1927b:127.—Johnson, 1934:70.—Clench & Turner, 1960:79.—Abbott, 1974:46.

**Description:** See Watson (1879:695; 1886:59).

**Holotypes:** BM(NH) 1887.2.9.210, height 7.5 mm, width 6.6 mm (*Trochus (Zizyphinus) strophorus*); USNM 108412, height 5.4 mm, width 5.0 mm (*Calliostoma arestum*).

**Type localities:** Off Culebra Island, Virgin Islands, CHALLENGER Station 24, 18°38'30"N, 64°05'30"W, in 713 m (*Trochus (Zizyphinus) strophorus*); off southern Georgia, ALBATROSS Station 2415, 30°44'00"N, 79°26'00"W, in 805 m (*Calliostoma arestum*).

**Distribution:** This species is known only from the two type specimens, one from off Fernandina, Florida, in 805 m, and off Culebra Island, Virgin Islands, in 713 m.

**Remarks:** Both Watson (1879, 1886) and Dall (1927b) based their respective species descriptions on unique specimens that were empty and somewhat damaged when collected. The specimen of *Calliostoma arestum* (figures 96, 97) is slightly smaller, has fewer whorls, and is more weathered than that of *Trochus (Zizyphinus) strophorus* (figures 94, 95), but both shells seem to represent the same species. These two shells are most similar to those of *C. circumcinctum* but differ principally by having three strong, rounded, beaded spiral carinae above the suture rather than the two very strong, blade-like carinae of *C. circumcinctum*; the shells of *C. strophorum* are also proportionately broader than those of *C. circumcinctum*. The shells of both *C. strophorum* and *C. circumcinctum* are very similar to those of *Otukaia blacki* (Dell, 1956) from New Zealand; *Calliostoma (Otukaia) delli* McLean and Andrade, 1982; from off Chile, and *Otukaia eltanini* Dell, 1990, from Antarctica, and could be included in the genus or subgenus *Otukaia* Icke, 1942, if that taxon gains general acceptance. Some recent authors (Powell, 1979; McLean & Andrade, 1982; Dell, 1990) are now using *Otukaia* at either the genus or subgenus level.

*Calliostoma adpersum* (Philippi, 1851)  
(figures 98–100, 121)

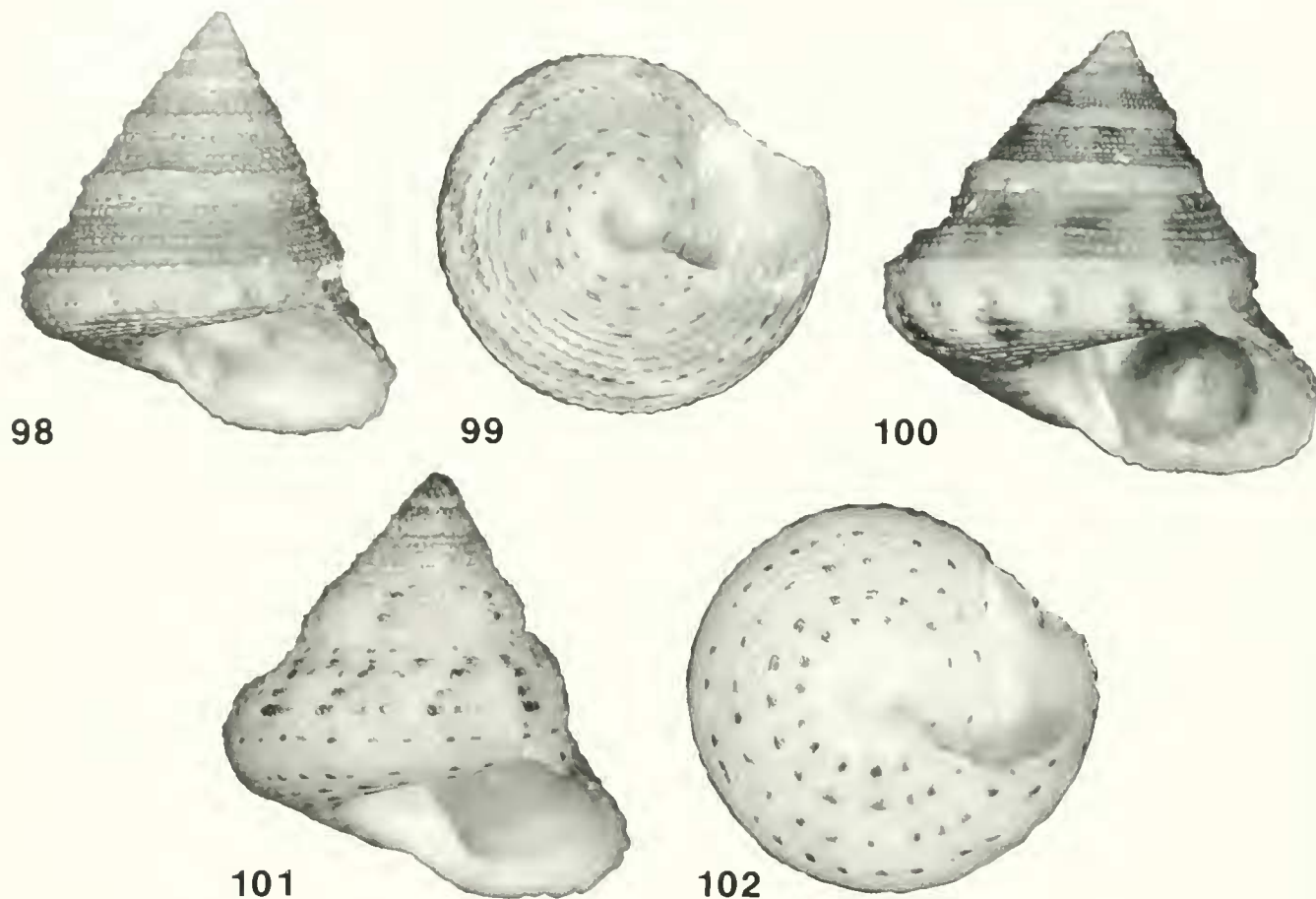
*Trochus eximius* Philippi, 1844 (in 1842–1851), vol. 1, pt. 6: 17, pl. 4, fig. 7. (Non *Trochus eximius* Reeve, 1843).

*Trochus adpersus* Philippi, 1851 (in 1846–1855): 217, pl. 32, fig. 5.

*Calliostoma aspersum*: Lange de Morretes, 1949:58.—Calvo, 1987:63, fig. 27. (Unjustified emendation).

*Calliostoma adpersum*: Calvo, 1987:63, fig. 27.

*Calliostoma (Kombologion) adpersum*: Clench & Turner, 1960, 46, pl. 30, figs. 1, 2 (partim).—Rios, 1970:25, pl. 4 (lower right) (partim); 1975:23, pl. 5, fig. 55, 1985:21, pl. 9, fig. 54, 1990:9, 10 (photographs).



**Figures 98–100.** *Calliostoma adpersum* (Philippi, 1851), specimens from off Cabo de la Vela, Colombia. **98, 99.** FSBC I 34044; height 17.9 mm, width 18.2 mm. **100.** Deynzer collection; height 16.3 mm, width 15.6 mm. **Figures 101, 102.** *Calliostoma depictum* Dall, 1927, specimen from off Salvador, Brazil, FSBC I 44110; height 10.3 mm, width 9.9 mm.

**Description:** See Clench and Turner (1960:46) and Rios (1990:9) for descriptions of shells. Animal (in alcohol): foot red-brown; mantle with narrow band of white at edge, behind which is broad, irregularly edged band of brown; cephalic tentacles long, slender, evenly tapered, ocular peduncles stout, about 25% tentacle length, with large, black eye at tips; snout long, broad, expanded at tip, red-brown, with anterior fringe of long papillae; epipodium with 3 pairs of red-brown tentacles, those on left larger, neck lobes well-developed, semicircular, left lobe finely fringed, right lobe smooth.

**Holotype:** Philippi's type material could not be located in the Museum für Naturkunde der Humboldt-Universität zu Berlin (R. Kilias, *in litt.*), and although it may be present in Chile, I consider it to be lost.

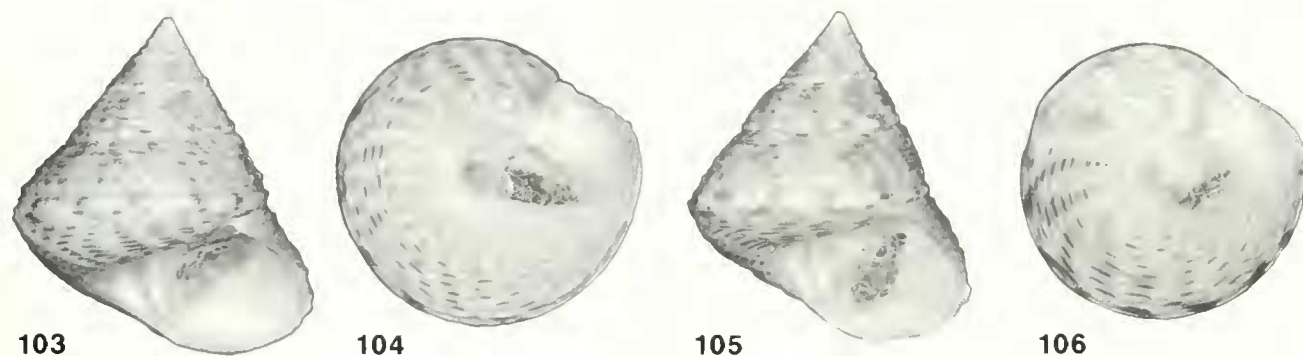
**Type locality:** Restricted by Clench and Turner (1960:47) to Praia do Leste, Ilha Guaíba, Estado de Rio de Janeiro, Brazil.

**Other material:** 1, UMML 30.8368; off Cabo de la Vela, Colombia, JOHN ELLIOTT PILLSBURY Station P-780, 11°39.0'N, 73°08.5'W, 18–27 m; 30 July 1968; 10-ft otter trawl.—1, FSBC I 34044; 21, Deynzer collection; off

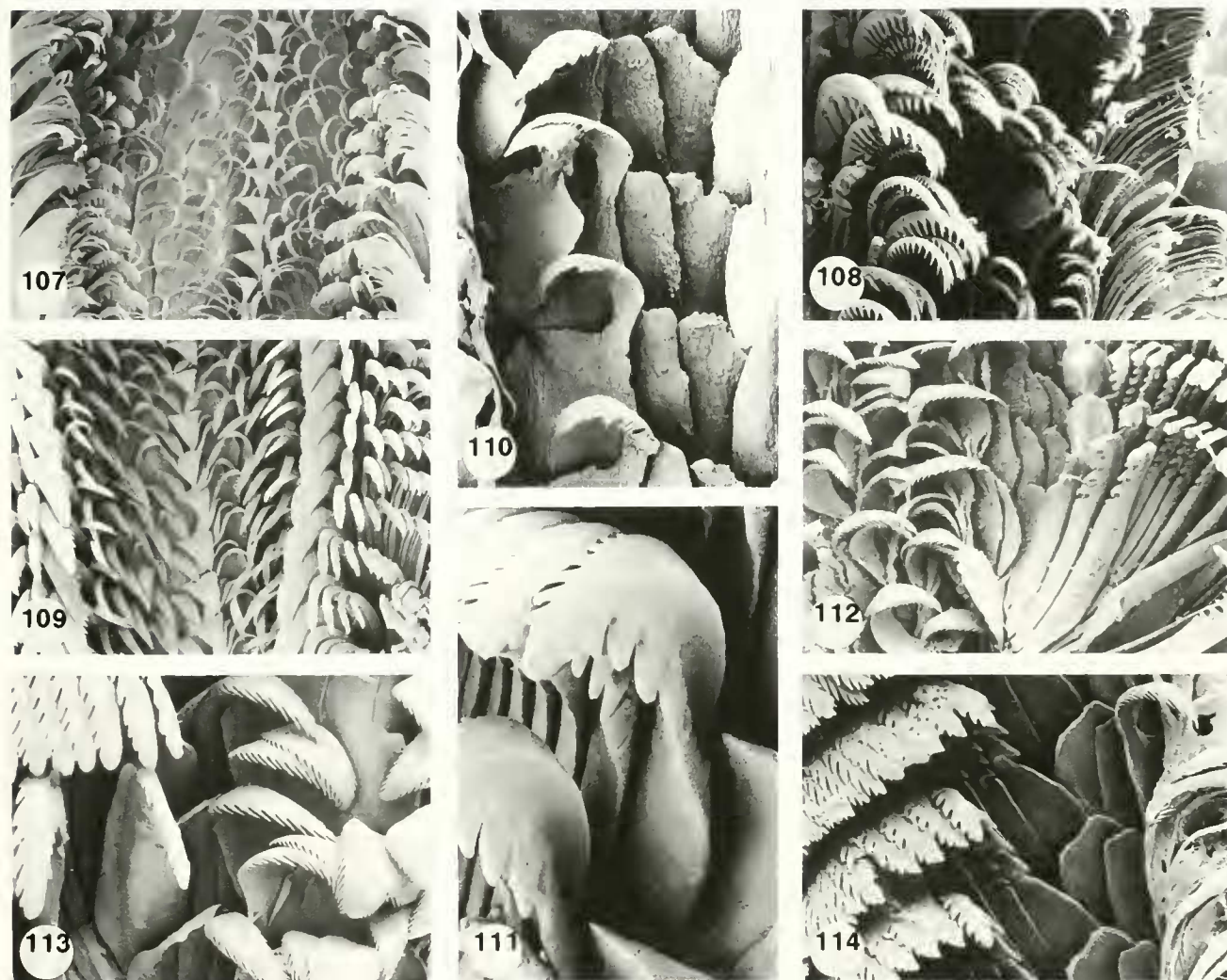
Cabo de la Vela, Colombia; 1990; shrimp trawlers.—1, UMML 30.7156; off Cabo de la Vela, Colombia, JOHN ELLIOTT PILLSBURY Station P-767, 12°16.1'N, 71°03.3'W, 24–26 m; 28 July 1968; 10-ft otter trawl.—1, UMML 30.7040; off Península de Paraguaná, Venezuela, JOHN ELLIOTT PILLSBURY Station P-758, 11°42.2'N, 69°40.0'W, 15–18 m; 27 July 1968; 10-ft otter trawl.—1, UMML 30.6888; off Tucacas, Venezuela, JOHN ELLIOTT PILLSBURY Station P-750, 10°36.1'N, 68°12.2'W, 22–26 m; 25 July 1968; 10-ft otter trawl.—2, UMML 30.6617; off Isla de Margarita, Venezuela, JOHN ELLIOTT PILLSBURY Station P-721, 11°06.5'N, 64°22.5'W, 26–27 m; 21 July 1968; 10-ft otter trawl.—1, UMML 30.6183; off Georgetown, Guyana, JOHN ELLIOTT PILLSBURY Station P-686, 7°00.0'N, 57°08.0'W, 27–26 m; 15 July 1968; 10-ft otter trawl.—2, UMML 30.5931; off Cayenne, French Guiana, JOHN ELLIOTT PILLSBURY Station P-655, 6°07.0'N, 53°39.0'W, 26 m; 9 July 1968; 10-ft otter trawl.—4, FSBC I 44109; off Guarapari, Estado de Espírito Santo, Brazil, 18–20 m; March 1991; ex J. & M. Coltro.

**Distribution:** *Calliostoma adpersum* was thought to be endemic to Brazil (Clench & Turner, 1960; Rios, 1970, 1975) until Rios (1985) reported its occurrence in Suri-

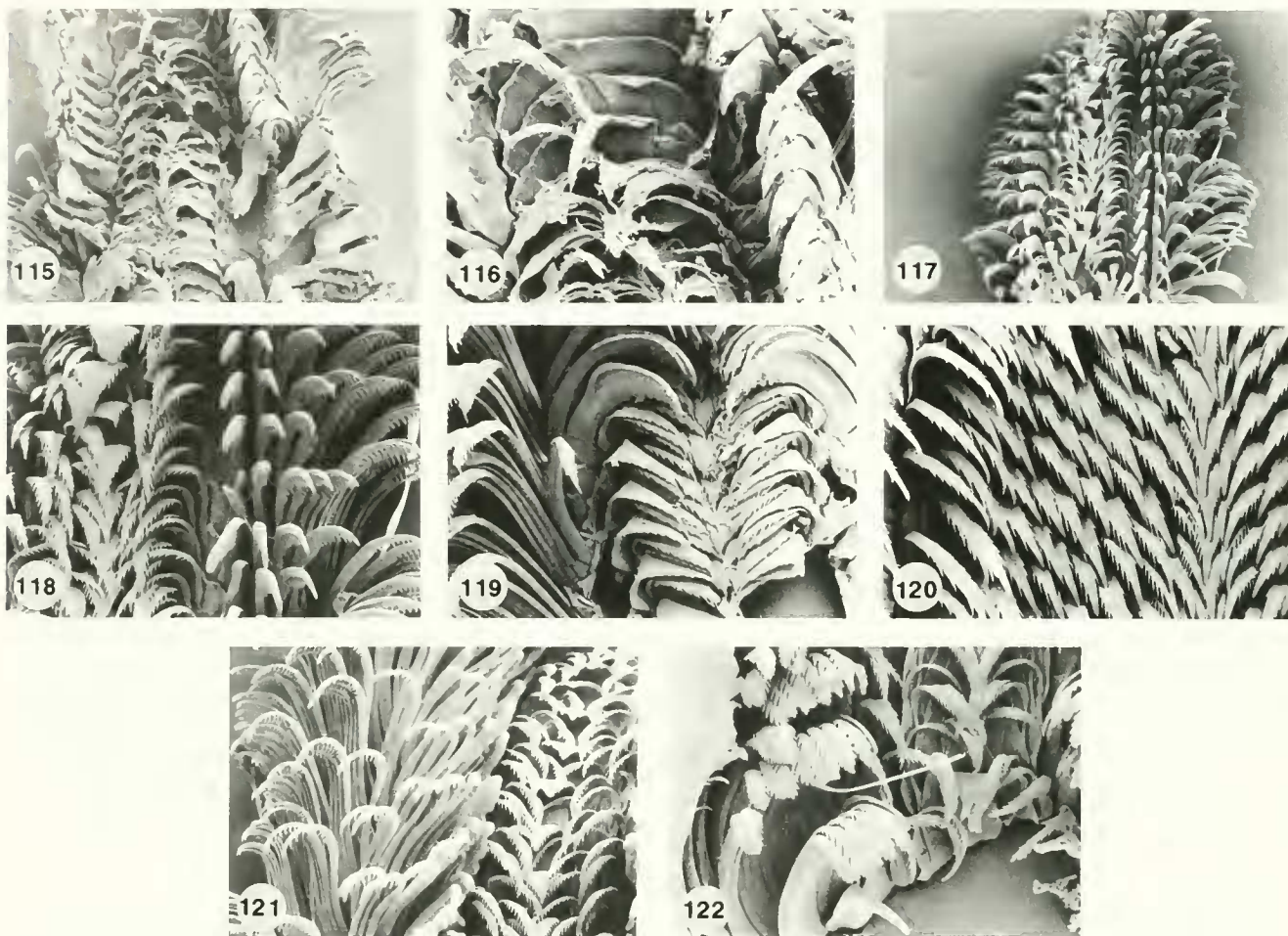




Figures 103–106. *Calliostoma scurra* new species. 103, 104. Holotype, USNM 860264; height 14.1 mm, width 13.3 mm. 105, 106. Paratype from JOHN ELLIOTT PILLSBURY Station P-834, FSBC I 44073; height 13.9 mm, width 12.7 mm.



Figures 107–114. Radulae of *Calliostoma* species. 107. *Calliostoma cnidophilum* new species, ex paratype, FSBC I 44070, 95 $\times$ . 108. *Calliostoma viscardii* new species, ex holotype, MORG 29.292, 310 $\times$ . 109. *Calliostoma moscatellii* new species, ex specimen from off Rio de Janeiro, Brazil; 65 $\times$ . 110, 111. *Calliostoma scalenum* new species, ex specimen from Campeche Bank, Yucatán, FSBC I 32311; 235 $\times$  and 435 $\times$ , respectively. 112. *Calliostoma jujubinum* (Gmelin, 1791), ex specimen from Cat Island, Bahama Islands, FSBC I 15698; 125 $\times$ . 113. *Calliostoma cubense* new species, ex paratype from off Península de Hicacos, Cuba, FSBC I 32405, 245 $\times$ . 114. *Calliostoma vinosum* new species, ex holotype, MORG 29.294; 280 $\times$ .



**Figures 115–122.** Radulae of *Calliostoma* species. **115, 116.** *Calliostoma atlantoides* new species, ex holotype, USNM 860261; 75 $\times$  and 160 $\times$ , respectively. **117, 118.** *Calliostoma rota* new species, ex paratype, MCZ 258057; 50 $\times$  and 115 $\times$ , respectively. **119.** *Calliostoma axelolssoni* new name, ex specimen from off Dominica, UMMIL 30.8373; 65 $\times$ . **120.** *Calliostoma aurora* Dall, 1888, ex specimen from Guadeloupe, USNM 860504; 70 $\times$ . **121.** *Calliostoma adpersum* (Philippi, 1851), ex specimen from off Guarapari, Brazil, FSBC 1 44108; 95 $\times$ . **122.** *Calliostoma depictum* Dall, 1927, ex specimen from off Ilhabela, São Paulo, Brazil, FSBC 1 44109; 190 $\times$ .

name. The present material establishes the presence of the species along the entire northern coast of South America, principally in depths of about 15–30 m.

**Remarks:** As noted by Rios (1975, 1985, 1990), the names *Calliostoma adpersum* and *C. depictum* (figures 101, 102) do not represent the same species, as was contended by Clench and Turner (1960). Shells of *C. adpersum* attain a larger size; have all whorls with a distinct shoulder angulation and flat-sided periphery; have more numerous, more unequally sized spiral cords; and have more diffuse color patterns than those of *C. depictum*. One juvenile specimen (UMMIL 30.7156; height 6.5 mm, width 7.3 mm) differs from larger shells by having an open umbilicus whose wall narrows rapidly from 1.6 mm to a pore-like opening only 0.3 mm wide; larger specimens have the umbilicus filled with callus. The radula of *C. adpersum* (figure 121) differs from that of *C. depictum* (figure 122) by having a more broadly cusped rachidian, by having fewer pairs of lateral teeth (4 *vs.*

5, respectively), and by having more numerous (about 40 *vs.* about 25) marginal tooth pairs whose cusps are narrower and have more slender denticles.

This species seems to occur most frequently in areas of “hard bottom” in the western part of its range (JOHN ELLIOTT PILLSBURY field data log) and on sandy mud bottom in the eastern and southern part (Rios, 1985; J. & M. Coltro, personal communication). *Calliostoma depictum* lives in depths of 1–7 m in sandy areas around rocks and corals (Rios, 1990), where it is often found living under an unidentified sea urchin (J. & M. Coltro, personal communication); the species is also found on *Sargassum* (Rios, 1985, 1990).

*Calliostoma scurra* new species  
(figures 103–106)

**Description:** Shell medium-sized, attaining height of 14.1 mm, width of 13.3 mm, conical, nonumbilicate,



rather coarsely sculptured. Protoconch 400–425  $\mu\text{m}$  maximum diameter, 1 whorl. Teleoconch whorls about 7, weakly convex; first 4 whorls with numerous low, rounded axial riblets and 2–5 finely beaded spiral cords; axial sculpture absent on subsequent whorls; spiral cords increasing by intercalation to 10–15, usually alternating in size, set with crowded, rounded beads; periphery weakly angulate, composed of pair of adpressed spiral cords, adapical cord stronger, beaded, abapical cord smooth. Base convex, with 12–19 strong, narrow, smooth spiral cords, interspace between abaxial 2 cords usually with 1–5 fine spiral threads and next adaxial interspace usually with 1 thread. Umbilicus filled with callus, shallow depression sometimes present. Aperture subquadrate, thickened within, often with channel corresponding to periphery, lips thin, weakly crenulate; columella very weakly concave, greatly thickened, with tongue of nacre extending outward to umbilical callus. Shell ground color cream with spots and irregular patches of reddish brown above periphery and irregularly crescentic streaks of same color on base.

**Holotype:** USNM 860264, height 14.1 mm, width 13.3 mm.

**Type locality:** Off mouth of Orinoco River, Venezuela, JOHN ELLIOTT PILLSBURY Station P-834, 9°04.1'N, 60°10.7'W, in 33–35 m.

**Paratypes:** 1, USNM 860265; 1, FSBC I 44073; 1, UF 189457; 1, MCZ 302590; 1, ANSP 389338; 1, LACM 2253; 4, UMML 30.7225; all from same lot as holotype.

**Other material:** 1, UMML 30.6529; off Isla de Margarita, Venezuela, JOHN ELLIOTT PILLSBURY Station P-718, 11°22.5'N, 64°08.6'W, 60 m; 20 July 1968; 10-ft otter trawl.—1, UMML 30.6374; off Península de Paria, Venezuela, JOHN ELLIOTT PILLSBURY Station P-705, 10°45.0'N, 62°00.0'W, 77–86 m; 18 July 1968; 10-ft otter trawl.—6, UMML 30.6359; Gulf of Paria, Venezuela, JOHN ELLIOTT PILLSBURY Station P-704, 10°34.3'N, 61°57.0'W, 18 m; 18 July 1968; 10-ft otter trawl.—1, UMML 30.6339; off Orinoco River, Venezuela, JOHN ELLIOTT PILLSBURY Station P-696, 8°38.0'N, 58°56.0'W, 55–59 m; 16 July 1968; 10-ft otter trawl.—1 + 1 fragment, UMML 30.5979; off Parimaribo, Suriname, JOHN ELLIOTT PILLSBURY Station P-663, 6°29.0'N, 54°41.0'W, 24 m; 10 July 1968; 10-ft otter trawl.

**Distribution:** *Calliostoma scurra* has been collected from off Suriname northwestward to off Isla de Margarita, Venezuela, in depths of 18–86 m; live-collected specimens are known from depths of 18–35 m.

**Remarks:** *Calliostoma scurra* does not seem to be closely related to any other western Atlantic species except, perhaps, *C. adpersum*. Shells of the latter species differ from those of the former by having a broad, flat periphery; by having distinct axial rugae in the interspaces between the primary spiral cords; by having finer, more numerous, more distinctly beaded suprapерipheral spiral

cords; by having a more oblique columella; and by having a different color pattern.

The field data indicate that this species lives on bottoms composed of mud, shell hash, and coral rubble.

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